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MICROFICHE 1969--A USER STUDY

by

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The stimulus for this study came from the Committee on Scientific and Technical Information of the Federal Council for Science and Technology. The opinions expressed herein are strictly those of the author and his correspondents. They do not necessarily reflect the official opinion of any Federal agency.

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FOREWORD

Lively concern continues in COSATI and in Federal agencies about the proper and profitable utilization of microfiche and other microforms. Some of their technical merits and potential for economy are obvious, but some user reluctance to accept them is both expected and experienced. The present study provides a valuable insight into user reactions to microfiche. COSATI plans to study the implications of this report along with other reports in related phases of the microform technology. At the same time, wider circulation of this report and further discussion of the general subject are clearly desirable. For this reason, COSATI has encouraged the dissemination of the report. Neither acceptance nor rejection of the report is implied by the present handling and publication procedure.

I wish to thank Dr. Wooster for undertaking this pioneering appraisal, his respondents for their cooperation, and the Air Force Office of Scientific Research for publishing the report.

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Chairman, Committee on Scientific
and Technical Information (COSATI)

PREFACE

"The good and bad points of microfilm, microcards and microfiche are too familiar to require extensive discussion here."

SATCOM Report, June, 1969

Background

I am not now, nor have I ever pretended to be, an expert on microfiche. Nevertheless, when I was invited to address the Third Annual Northeastern DDC/Industry Users Conference in Waltham, Massachusetts in April of 1968 I had the temerity to attempt to describe what I as a user would like to have in a fiche reader. ("Towards a Uniform Federal Report Numbering System and a Cuddly Microfiche Reader--Two Modest Proposals." Revised September 1968. AD-669204)

My proposed design has been greeted with enthusiasm by users and apathy by manufacturers. It has had two real effects.

(a) The adjective "cuddly" has almost become a term of the art.

(b) I was asked by Colonel Andrew A. Aines, USA (Ret), Chairman of COSATI, the Committee on Scientific and Technical Information on the Federal Council for Science and Technology, in a letter dated 6 June 1968, to "head a small two or three month effort...to come up with an appraisal (of user acceptance of microfiche) and recommendations for action, if warranted."

My reply to Colonel Aines was in the form of the classical military position appreciation:

1. Mission--to ascertain reactions of scientists and engineers to microfiche.

2. Appreciation of position--no time, no money, no people; Morgan has critical shimmy at 50-60 mph and needs wheels rebuilt, Chevvy needs to go into body shop, red racing bicycle stolen and can't afford to replace, yellow Italian motorcycle at Ward's too expensive. Materiel, personnel and logistic shortages rule out school solutions of (a) extensive site visits (b) hiring contractor to make study.

3. Solution--conduct preliminary reconnaissance by mail. Presume on old friendships. Write letters:

a. To scientific and engineering journals.

b. To AEC depository libraries insisting on receiving microfiche only.

c. To members of Military Librarians Association and Special Libraries Association.

A note on methodology

In a proper, classical user study one:

1. Devises a properly structured questionnaire (and has it cleared through the Bureau of the Budget, in accordance with AFR 171-11/ OARSUP-1, AFR 171-11, Implementation of the Federal Reports Act, and Budget Bureau Circular A-40 and A-17.) Preferably the questionnaire should be in a form suitable for subsequent machine analysis of the replies.

2. Selects as large a sample of prospective interviewees as the sponsor is willing to pay for.

3. Exposes the interviewees to the questionnaire, by mail if necessary, but preferably by actual office encounter with a suitably trained interviewer. One such study, for example, interviewed 1500 people from a sample population of 120,000.

4. Machine tabulates and analyzes the answers.

5. Writes a thick report.

In the more formal language of "National Document Handling Systems for Science and Technology" (AD 624 560, PB 168 267, Wiley, NY 1967) "Almost without exception all (58) studies utilized questionnaires and interviews similar to those commonly seen in survey research. Such an approach employs a set of questions designed to elicit responses which can be categorized and quantified."

All too often in such studies much of the effort is devoted to discovering that the people you are interviewing don't know what you are talking about. The "Auerbach Study" (DoD User Needs Study" Auerbach Corporation, Philadelphia, Pennsylvania, Vol I AD 615 501, Vol II AD 615 502) interviewed 1,375 scientists from an estimated DoD user population of 36,000. They found that 687 of these didn't know about their own local information services; 261 had never heard of any of the specialized Department of Defense information centers. If the study had been devoted to studying the effectiveness of local information services half of the interviews would have been wasted except for their salvage value--not knowing about an information service is certainly a valid, if unilluminating, commentary on its effectiveness!

It would be interesting, to find out what percentage of the nation's million or so scientists and engineers had ever heard of, or seen an actual, microfiche. (Teams of mini-skirted interviewers, each armed with a double Veeder-Root counter and a sample fiche hidden in their reticule stand at the turnstiles of conventions asking and clicking away--the results broken down by scientific disciplines. The mind boggles at the thought--and wonders why the study has not been proposed.)

And a very proper study would indeed have determined as a necessary first step what percentage of the user population had been exposed to microfiche and only then gone on to find out what those who had been exposed thought of it. My time and uncommitted resources (a GS-2 summer hire who was an unexpectedly good typist) did not permit determining this parameter; what I thought I might be able to do was to skip the first step and concentrate on the second.

My first rule, then, was never to attempt to define (or explain, or apologize for or I hoped, atone for) microfiche. I didn't want to hear from anyone who didn't know what it was (but had an opinion anyway).

My second rule was to make it slightly difficult for people to get in touch with me--no questionnaires, no pre-paid envelopes, no office interviews--just my office address and the inference that if they would write me a letter I would read it.

There would be no point in setting up barriers if one did not give people an opportunity to cross them. The next step was to attempt to reach as many people as I could with the resources I had at my disposal (the aforementioned GS-2). This meant that every letter I sent out had to do at least double duty--I wanted to reach people who not only had opinions of their own about microfiche but could speak authoritatively about the opinions of one or more others as well.

The one person in any given scientific organization who best knows what its scientists and engineers read is the librarian. So, I wrote letters to librarians. (For those who worry about such matters, these were "personalized" letters. A Flexowriter would have been nice, but since I didn't have access to one I had the body copy multilithed, addressed them individually and signed them).

First of all, 120 letters to members of the Military Librarians Association, since these were the people who had most recently been forced to learn about microfiche. This is the letter they received:

"Col. Aines, the Chairman of COSATI, has asked me to look into the acceptance and use of microfiche by scientists and engineers. I suspect that this question is not unrelated to the recent decision that DDC is to try to encourage the use of microfiche by preferential pricing.

I do not want to conduct (or sponsor) an elaborate survey, but I would appreciate a letter setting forth any opinions you may have on such topics as: acceptance and use (or rude remarks) made by your customers concerning microfiche; have any of them learned to work with fiche, or do they insist on using a reader-printer to print some (or all?) pages; quality, durability, convenience of currently available microfiche readers (are any outstandingly bad, or good?); have you had previous experience with microfiche from, say, NASA, AEC, or ERIC, or will the DDC fiche be your first experience; etc. ?

I can't guarantee to answer all correspondence, but anyone who writes me will get a copy of my final report--in full-size hard copy!"

An Office of Education publication listed 31 libraries as having added

more than 1,000 microforms during 1965. The letter these librarians received differed from the foregoing in the first two paragraphs:

"COSATI (the Committee on Scientific and Technical Information of the Federal Council for Science and Technology) has asked me to look into the acceptance and use of microfiche by scientists and engineers. I suspect that this question is not unrelated to the growing tendency for Federal agencies to encourage, by such devices as differential pricing, the distribution of microfiche in lieu of hard copy.

Your library is listed (in "Survey of Special Libraries Serving the Federal Government" OE-15067, undated but presumably 1966) as having added more than 1,000 microforms during the year (1965?). I assume that at least some of these get passed on to your customers."

Many, if not all of the librarians in research and engineering establishments tend to be members of the Special Libraries Association. I went through the SLA membership list and sent the following letter to 175 who showed interesting academic or industrial affiliations:

"There has been a growing tendency for Federal agencies to encourage, usually through differential pricing, the distribution of microfiche instead of sull size copies of reports. The economic advantages of microfiche are obvious to the issuing agencies (and to the General Accounting Office); agency distribution lists show that some libraries actually prefer to receive microfiche. We have little information, however on the acceptance and use of microfiche by individual scientists and engineers.

I have been asked by COSATI (the Committee on Scientific and Technical Information) to look into this matter. The thought of hiring a contractor to conduct the usual sort of "user survey" gives me an acute pain in the pocketbook, especially in this year of tight budgets. Accordingly, I am taking the informal route of writing you, as a member of SLA, to ask if microfiche is now a regular or occasional part of your stock in trade? If so, how does your clientele like it? Have any of them learned to work with microfiche directly, or do they insist on making full-size hard copy first? Do you have facilities for reproducing fiche locally or otherwise giving your users retention copies? Are you satisfied with the quality, convenience, legibility, etc. of presently available microfiche readers or reader-printers? Do any of your users maintain personal collections of fiche; would they like to tell me how they do it?"

All told, I mailed out 327 letters to librarians. I did not check the mailing lists for duplications, either of individuals or organizations. In one case, I know, I managed to send letters to six individuals connected with the same library! In spite of this duplication I received 170 replies, slightly better than 50 percent. As the text of this report will show, these were good thoughtful replies, running up to 2 to 3 single-spaced pages. And I'm afraid that some of them hinted wistfully that it was nice to know that there was someone in Washington who cared.

All this, though, without giving a single scientist or engineer an opportunity to express his opinion. Again I sought leverage by adopting a device old in scholarship but apparently untried in this field of user studies--the Letter to the Editor. I sent the following letter to the editors of perhaps dozen journals:

"There has been a growing tendency for Federal agencies to encourage, usually through differential pricing, the distribution of microfiche instead of full size copies of reports. The economic advantages of microfiche are obvious to the issuing agencies (and to the General Accounting Office); agency distribution lists show that some libraries actually prefer to receive microfiche. We have little information, however, on the acceptance and use of microfiche by individual scientists and engineers.

I have been asked by COSATI (the Committee on Scientific and Technical Information of the Federal Council for Science and Technology) to look into this matter. Those of your readers who have actually been offered the opportunity of using microfiche and have strong opinions on such subjects as legibility, convenience, availability and quality of readers and reader-printers and kindred topics are encouraged to write to me at: AFOSR/SRI, 1400 Wilson Blvd., Arlington, Virginia 22209. I am especially interested in hearing from those who have found it possible, or even preferable, to use microfiche in maintaining their personal report collections. I can not guarantee to answer individual letters, but all respondents will receive copies of a summary report-in full-size hard copy!"

The letter was rejected by Science ("The number of communications submitted is considerably larger than the number we can publish."),

Chemical and Engineering News ("We do not publish letters which solicit in any way a reply from our readers, as we are simply not in a position to handle this sort of thing.") and Physics Today ("It does not seem appropriate for us to conduct a survey on this subject or to publish a notice that would accomplish the same purpose.")

My records show that this letter was printed by the following journals:

Applied Optics (Feb 69, Vol 8 #2)

Chemical Week

Communications of the ACM (Oct 68)

Datamation (Aug 68)

Data Systems (July 1968)

DDC Digest (June 1968)

Information Usage Newsletter (U of Leicester, England)

Research/Development (Sep 68)

Science and Technology (Sep 68)

Space/Aeronautics

STWP/NY Chapter Notes

USAF STINFO Newsletter

When Dr. Samuel Johnson was asked by a woman why he had included an erroneous definition of a word in his dictionary he replied "Ignorance, ma'am. Simple ignorance." And simple ignorance of what journals were available kept me from finding journals which would reach members of the educational community, especially ERIC users--probably the single largest deficiency in this study--biologists, behavioral scientists and non-computer oriented mathematicians.

Nevertheless I did receive over 136 letters from individuals in response to these "Letters to the Editor". (Another COSATI study, using the same Letters to the Editor technique on what is apparently a less controversial topic has received 45 letters to date.)

I now had over 300 information-bearing letters, plus perhaps another 50 from free-loaders ("I don't know from nothing about microfiche but please send me a copy of the report you promised to send to anyone who answered your letter."!!!). What to do with them?

My first step was to establish the following ad hoc categories:

Libraries. I have used the term to embrace both libraries and "information centers". Letters were put into this class if they were signed by an individual operating an information activity. A number of these letters discussed reactions of users other than the author. These latter comments are included among the user portions of the text.

Individuals. These were people who signed letters giving their own reactions to microfiche.

For. I have reserved the use of this term for those letters which gave an unequivocal endorsement of the use of fiche. This term will be applied only to letters from individuals. I found no library letters which regarded fiche as an unalloyed blessing.

For, with reservations. This is the most subjective of my categories. It could equally well have had a twin, "against with reservations for". Letters placed in this category contained some such phrase as "I like microfiche, but..." All libraries which had extensive microfiche holdings fell into this category.

Against. This classification offered few problems in dealing with individual letters (e.g., "The man who invented microfiche should be drawn and quartered."). It became more difficult in dealing with libraries, until I realized that the most operational way for a library to vote against microfiche is not to use it. Accordingly both those libraries who damned microfiche while using it, and those who damned it by not using it were placed in the "Against" category.

Corporate authors. In most cases it was possible to infer the type of employer, even when the letters were hand-written on post cards. Most types of employer offered no classification problem. I made the arbitrary decision to list the AEC contract research laboratories, such as Oak Ridge National Laboratory and Los Alamos Scientific Laboratory under AEC as the corporate author, even though one of these is more properly industrial and the other university.

I had one other methodological problem, which would not have arisen if I had used a questionnaire. With a questionnaire I could have tabulated my answers and let it go at that. But I had 300 good letters, written with far more feeling and insight than I could muster--far too good to bury in my files.

In reviewing a book by one of my favorite authors (I like authors who stimulate me to write what I think are clever reviews) I wrote:

"This is one of the standard ways of manufacturing a non-book--great gobbets of undigested excerpts glued together with a bland, and usually non-offensive prose."

Peccavi! This report was manufactured by excerpting more than 300 letters and gluing them together with a necessary minimum of prose as bland and non-offensive as I could secrete. I have not identified my correspondents. In fact, I have made it as difficult as I could to connect their personal and corporate identities with their letters.

Oh yes, the bibliography

There is a strong suspicion within the trade that at times literature searches are done after the project is almost over, rather than before beginning it. I used the good offices of ASLIB, the Association of Special Libraries and Information Bureaux, to do my literature search, with the results set forth in the following letter:

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We have searched our catalogue, Library Science Abstracts, vol. 12-;

Library Literature, 1958- and Referativnyi Zhurnal 59, vol. 5-; as well as Microdoc, NRC d Bulletin and similar journals for material of British and European origin. Unfortunately, the following is the only item of much substance which we found to be specifically relevant:

PAWSLEY, Gwyneth
Microfiche; reasons for its unpopularity and recommendations for improving the library service in relation to microfiche.
Derby, Rolls Royce, 1965.
vi, 7, [8]p. (Series no. RR (OH) 233)

Figures indicating the acceptance of microfiche in various British organisations are contained in:

WILLIAMS, B.J.S.
Evaluation of microrecording techniques for information and data storage and retrieval.
[Hatfield, Herts.], Hertis, 1967.
vi, 104p.

Apologia

In discussing user studies (in Vol 3 of Annual Review of Information Science and Technology) Bill Paisley writes: "We have seen too many field studies in which shallow conceptualization leaves the investigator without validity checks, without qualifying variables, and without the ability to reject alternative interpretations of his findings. Conceptual poverty is independent of methodological richness." And this report hadn't even been written.

This study was certainly conceived in poverty. Its methodology was equally stark. I have doubts about its statistical validity. Not in my own decisions in sorting the letters I received into piles, although my interpretations are certainly subject to error. I think now that the fundamental flaw in this study is inherent in human nature. It is much easier, and much more fun, to criticize than to praise; to vote against candidate B rather than for his opponent, A. And although I biased all my letters of inquiry to try to find those people who had

adopted microfiche for their personal literature collections, counting on their hobbyists' enthusiasm to provide a stimulus for writing a letter, and thereby may have produced a slightly higher percentage of favorable responses, my method of sampling provided no way of reaching those patient souls who regard microfiche as just one more damned roadblock and accept it without grumbling.

I am proud of my correspondents, their intelligence, their wit and their enthusiasm. I am becoming increasingly ennuied with bureaucratic prose, most particularly my own. The bland, grey sludge turned out by committees makes me atrabilious. Therefore, I have let my correspondents speak for themselves (I did correct their spelling); the bulk of this report is made up of excerpts from their letters. I hope you enjoy reading them as much as I did.

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ACKNOWLEDGEMENTS

The following individuals wrote letters which formed the basis of this report. These were good letters, both in style and in content. In a less controversial field I would have followed normal scholarly practice and attributed each excerpt to its author. Many of my correspondents, however, requested that their names not be used in connection with their letters. I have, accordingly, compromised by using excerpts without attribution and here, in small repayment of the debt of gratitude I owe them, list the names of those who made this report possible.

Especial thanks go to my secretary, Mrs. Texie Lee Gleeson, whose task in typing this report was not made easier by the large number of handwritten letters, complete with creative spellings, and idiosyncratic calligraphy, that we received.

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CHAPTER I
SUMMARY, RECOMMENDATIONS AND CONCLUSIONS

Source of Information

Somewhat over 300 letters received in response to "Letters to the Editor" in various journals, plus direct correspondence with members of the Military Librarians Association and the Special Libraries Association.

The information-bearing letters were sorted into the following categories by source of employment of the authors:

Source	Individuals	Libraries
Industry	71	60
Universities	20	19
DoD	30	65
NASA	5	5
Other Federal agencies	10	12
	136	170

Libraries and microfiche

Replies from libraries were tabulated as follows:

	For, with reservations	Against, or don't use
Industry	40	20
University and NFP	7	12
Department of Defense		
Air Force	8	19
Army	5	14
Navy	5	14
NASA	5	0
AEC	9	0
Other Federal agencies	7	5
	86	84

Industrial libraries, and the bulk of these were aerospace companies, led all others (with the exception of the captive libraries of AEC and NASA) in the use of fiche.

Conversely, DoD libraries (and there is absolutely no significant difference among the three services) and university libraries lagged behind all others in the use of microfiche. For many of the DoD libraries in the "Against" column, DDC's 1 July 1968 imposition of user charges for hard copy was their first exposure to the use of microfiche. The timing of this action to start at the beginning of a fiscal year created a number of special problems among libraries which had neither microfiche reading equipment nor money programmed in their FY 69 budgets to buy it.

One encouraging note among DoD libraries was from those in service academies and the Air Force Institute of Technology which said that cadets, midshipmen and students at AFIT accepted fiche with far less grumbling than their elders--"Apparently they were never told that this was not normal procedure. Further, they were young, adaptable, and less set in their ways."

Industrial libraries reported holdings of up to 300,000 NASA and DDC fiche in a single library. User adoption of fiche seems to be by force majeure:

"Since time is a crucial factor in many instances our engineers are grateful for any form of a report which is available NOW! Therefore, forced by economic and time factors to use reports in microfiche form, most engineers have adapted to the way it is!"

Libraries with successful microfiche installations seemed to share the common characteristics of:

a. Enthusiastic librarians who were able to;

b. Get the support of management, especially in providing enough money to;

c. Buy adequate numbers of microfiche readers, reader-printers and copiers (and filing boxes for individuals to use!), and

d. Coax, cajole and educate their users into giving fiche a fair trial before they condemned it.

Individuals and microfiche

The following replies were received from 136 individual users:

	For	For, with reservations	Against
Industry	17	18	36
University and non-profit	7	4	9
Department of Defense	9	9	12
NASA	2	--	3
AEC	2	--	3
Other Federal agencies	4	--	1
	41	31	64

The sample size was too small to justify statistical analysis within the rows. Responses from all sources were pooled in the following discussion.

The 41 enthusiasts for microfiche constitute a fairly rigorous counterproof to the statement "No scientist or engineer can, or will or should use microfiche." Conversely, the 47 percent of the sample who were against microfiche left no doubt as to their opinions.

Reasons for liking microfiche

Building personal reprint collections	11
Save storage space	7
Ease of retrieval and manipulation (!)	3
Low cost of fiche	3

A personality profile of the typical microfiche fan would closely resemble what we information scientists term, technically and non-pejoratively, a "pack-rat". That is, a heavy literature user with an extensive reprint collection, fairly large expenditure of personal funds on books and journal subscriptions and, as is the unfortunate lot of pack-rats, an unsympathetic supervisor who can't understand why they must live in that clutter.

These people, may their tribe increase, are obvious markets for:

a. Books and journals on microfiche.

b. Personal, portable (and even "cuddly", to use a term of the art) microfiche readers.

And, less obviously;

c. Inexpensive personal or coin-operated step and repeat cameras so that they can make their own microfiche of material not otherwise available on microfiche. (e.g., income tax files!)

They are not, repeat not, a potential market for reader-printers, and should be discouraged from acquiring them.

Reasons for disliking microfiche

The 47 percent of individual users who disliked microfiche did so for the following reasons, ranked in descending frequency:

1. Unavailability, or difficult access to, readers for their own use.

2. Inability to make notes on fiche.

3. Poor optical and mechanical quality of readers.

4. Can't read fiche at home, on airplane, etc.

5. Can't flip pages, refer back and forth from appendix to text.

6. True cost of blow-backs is probably greater than 25¢ a page, especially when scientists or engineers must operate the reader-printers themselves, as is frequently the case.

7. Print-outs are unwieldy, thick, curl up into Dead Sea scrolls.

8. Personal reading rates are slower.

9. Can't read and work with graphs, tables, and continuous-tone photographs, especially with negatives when they're accustomed to reading positives!

10. Can't identify fiche by color and physical location.
    Can't scan quickly.
    Poor indexes to what's available on fiche.
    Hard to store.
    Can't tear pages out, either for personal files or to buck to friends.
    Can't read titles without readers.
    Lack of standardization in fiche size (e.g., COSATI vs. industry standards).

My casual conversations with scientists in this establishment and elsewhere had led me to think that the people who objected to microfiche didn't like to read anyway, and that microfiche gave them one more convenient excuse. This is not the impression I gained from these letters. It may be highly subjective, but the impression I get is of people who are good, sometimes almost compulsive readers, who have built up good reading habits (if I may be forgiven for writing like my librarian father) and who are intensely frustrated by having artificial barriers placed between them and the printed word.

What's wrong with today's microfiche equipment?

Dissatisfied users vented especial and detailed anathemas on microfiche reading equipment currently available. Their objections included, but were not limited to:

Fixed viewing angles, requiring constant head position. This is particularly difficult for readers with bi- and tri- focal glasses.

Inability to read sideways layouts without crawling up on desk.

Screen glare.

Focussing problems across entire fiche, a carrier alignment problem.

Poor definition of lenses, compounded by poor quality fiche.

Need for families of lenses, to cope with varying reduction ratios of fiche.

Tendency for motion sickness, caused by movement of images across screen during search.

Need to keep fussing with focus.

Lack of light shields so that sufficient contrast is not available unless overhead lights are turned off.

Not easy to flip from text to appendix and find frame you departed from.

Lack of portability--putting a handle on it doesn't make it portable!

What's wrong with microfiche themselves?

Poor quality control. Readers report missing pages, others out of focus.

Lack of continuous tone emulsions makes photographs (e.g., photomicrographs of metal structures) useless, especially on negative fiche.

Fingerprints, splotches, daubs and mildew on fiche.

Subscripts, superscripts, and foot-notes set in 6 point type disappear when journal articles are microfiched.

"As for report organization, defense agencies have a significant job to do. When the illustration on page 24 is discussed on page 17; when a citation to number 12 in the bibliography sends one to page 124; when the organization and contents of a chapter are found only by locating the Table of Contents beginning on page iv; when the colorphoto illustrations are meaningless blurs in black and white; when the labels on a graph read like engraving on a wedding band, the willing microfiche user is in trouble and tends to revolt."

Recommended COSATI action

The single most appropriate and efficient action for COSATI to undertake is to modify or rewrite the Federal Reports standards to provide standards for microfiche masters.

The following items are recommended for consideration:

Reports are to be designed from the beginning for microfiche.

No sideways layouts.

No fold-outs. If fold-outs must be used, all pages are to have self-contained legends.

All tables should be next to the pages in text referring to them, even if it is necessary to go to multiple copies of tables.

Figures and tables should appear as close to the discussion text as possible.

Reference to figure or table numbers should be accompanied by a frame (or page) designation as well.

If the final fiche the consumer receives is to be a negative, then all art work and photographs in the master should also be negatives.

General recommendations

There would seem to be three, and only three, possible strategies for dealing with microfiche:

A. Ignore it and it will go away.

B. Drive it underground.

C. Learn to live with it until something better comes along.

(B and C are not mutually exclusive)

A. Ignore it and it will go away.

Q. The late Sam Alexander (in Libraries and Automation, Library of Congress, 1964) listed the following facsimile storage and retrieval systems:

Army Tactical Operations Central-ARTOC (Aeronutronics); Automatic Image Retrieval System-AIRS (Recordak); Automatic Image Retriever (Houston-Fearless); Automatic Minimatrex (Jonkers); Command Retrieval Image System-CRIS (Information Retrieval Corp); Data Bank (Benson-Lehner); DoD Damage Assessment Center-DIDDAC (Thompson Ramo

Wooldridge); Document Abstract Retrieval Equipment-DARE (Bell & Howell); Documentary Storage and Retrieval System (Henry Staats); Eccetron (Marcel Locquin); E-Z Sort with Aperture Insert (E-Z Sort Systems, Ltd); Fast Access, Coded Small Images--FACSI (FACSI, Inc.); FILESEARCH (FMA, Inc.); Film Library Instantaneous Presentation-FLIP (Benson-Lehner); Film Optical Scanning Device for Input to Computers FOSDIC, II, IV (National Bureau of Standards); FILMOREX (Jacques Semain); FILMSORT (with EAM equipment) (Remington Rand); Graphic File and Retrieval System (Itek); Hi-Speed Color Printer (RCA); Intellofax (CIA); Keysort with Microform Inserts (Royal-McBee); LODESTAR with Image Control Keyboard (Recordak); Lodestar with Kodamatic Indexing (Recordak); MAGNAVUE (Magnavox); MEDIA (Magnavox); METRICARD Analysis Console with Computer (Thompson Ramo Wooldridge); MICROCARD System (Microcard Corp); MICROCITE II (National Bureau of Standards); Microfilm Finder-Reader System (MIT); Microfilm Storage and Retrieval System (Mosler Safe); Micro Image Locator (National Bureau of Standards); MICROLEX File (Lawyers Corporative Publishing Co); Micro Research System (Petroleum Research Corp); MINICARD (Eastman Kodak); MINIMATRIX (Jonkers); MIRACODE (Recordak); Photochromic Micro-Image System (National Cash Register); Photo-Magnetic System (Peter James); Random Access Document Indexing and Retrieval--RADIR (Hallicrafters); RAP 600 (System Development Corp); Rapid Access Look-Up System (Ferranti-Packard); Rapid Selector (National Bureau of Standards); Seventy Millimeter Selector (Photo Devices, Inc.); Unitized Microfilm System (Xerox Corp); VERAC (AVCO Corp); Video File System (RCA);, and WALNUT (IBM).

The student is asked to identify those systems which are:

1. Still in production.

2. In use at more than one installation.

3. Have found wide-spread adoption.

A recent Eastman Kodak sales brochure, "The Responsive Image with Total Recall", subtitled "A practical study in micrographics and information technology" illustrates the following application of microfilming techniques:

Six million Blue Cross documents.

Sixteen miles a month of mortgage records.

200 million department storage charge records.

Two library charge-out systems.

One hundred and thirty miles of school records.

Fifty miles of paper spectrographs.

Three million canceled checks.

"Miles" of printouts of homemakers' opinions.

Millions of transit and bookkeeping records.

Six million bank checks a month.

A mile of microfilm a day in a Boston bank.

Acres of computer printouts in another bank.

Twenty-six million bank documents a year.

Fifteen-thousand credit union members' quarterly statements.

Tons of scattered city records.

Reclaiming 5,000 square feet of space by filming court records.

A million dollars worth a month of security movement certificates.

Three million city records.

Two thousand cubic feet of ledgers.

Chemical Abstracts Service on microfilm.

Fifty million feet of microfilm libraries of paper catalogs.

Ten thousand railroad waybills a month.

Two hundred thousand land records.

Two hundred and fifty thousand, 500 page life insurance agent payment records.

Fourteen thousand page parts catalogs on microfiche.

One hundred thousand engineering drawings on aperture cards.

Six hundred thousand engineering drawings on aperture cards.

Twenty million pages of U.S. patents on microfiche.

Roomful of medical records.

Microfilming hospital radiograph records.

Over one hundred cabinets of patient records.

One hundred and seventy thousand air bills a month.

One million, two hundred thousand customer listings.

Airline service manuals.

Three million utility customer records.

Four million gasoline credit card applications.

Seventy-five hundred waybills a day.

Ten thousand waybills a day.

Two and a half million credit card applications.

Three hundred thousand accident records.

Two hundred and ninety million Social Security earnings records a year.

Millions of day-to-day policy changes.

Millions of Blue Cross documents.

Hundreds of thousands of bank checks a day.

One point three million engineering drawings on aperture cards.

Thirty thousand pages of oil royalty records.

And not one word about the topic of this report--NASA, AEC, or DoD scientific and technical reports on microfiche!

A library which has been conscientiously accumulating government reports over the past two decades may well find that it now holds:

AEC microform reports in microcard and microfiche. Two files to account for the change in size of the forms.

NASA microfiche--two files, the size again.

DoD microfiche. Be grateful that there is only one size.

DoD microfilm, filed by numbered reels. Be grateful that it is only in 35mm.

Engineering drawings on aperture cards.

One or more readers for 16mm cartridge microfilm readers to take care of such items as manufacturers' catalogs or American Chemical Society journals. There is at least a strong probability that the 16mm cartridges are not interchangeable among the different readers.

The librarian who has watched Federal agencies switch from 35mm roll microfilm to microcard (remember?) and now microfiche, buying equipment to read each microform, and watching it grow dusty

and who knows that somewhere down the pike are things like ultra-microfiche, and photochromic fiche, and who has listened to glowing tales of how someday all information will be in a central data bank (either digitalized in a computer or stored as images) with console access may well be pardoned for thinking that microfiche is just the latest fad. Perhaps some day a microform will be produced that will prove as useful for scientific and technical information as aperture cards have for engineering drawings, 35mm microfilm for scholarly (i.e., archival) documents, 16mm cartridge microfilm for journals and manufacturers catalogs (and most of the other applications cited in the Kodak brochure referenced above).

The evidence in my following chapters shows that microfiche is not as yet that form.

B. Drive it underground.

There is strong evidence in this report that librarians can learn to live with microfiche, and even grow to like it. Microfiche has many advantages for library operations. It is economical to buy, to mail, and to store. Filing and retrieval are no more difficult, and in many ways easier than with conventional hard-copy reports. Microfiche enables a library to have available, for immediate access, copies of several hundred thousand reports, without having to take over most of the plant for document storage. Reading is the main problem, but it is rare that a librarian would have to read more than a few pages of fiche--just enough to identify and catalog it.

The major squawks occur when a scientist or engineer is handed a microfi and pointed in the direction of the nearest reader. I see no reas. why he has to be told that there is such a thing as microfiche; the existence of microfiche could well become a closely guarded secret between the librarian and its Federal document supplying agency. The scientist user has certainly become accustomed over the years to trying to read illegible reproductions of reports made from microfilms at a central agency. There is no reason why he should ever have to know that the illegible document he is handed was locally reproduced from a microfiche rather than centrally at DDC.

The individual who insisted upon purchasing microfiche himself might well be issued a warning slip:

NOTICE: Contents of this package may prove hazardous to your eyesight. It requires delicate and expensive reading equipment. Do not use without professional advice.

C. Learn to live with it until something better comes along.

Microfiche is not the ultimate system, but I have no doubts that it can be made to work, given sufficient time, money and goodwill. The chief problem with microfiche is that, unlike, say 16mm cartridge microfilm for manufacturers' catalogs, it is not a system. It is a more or less random aggregation of loosely standardized, but essentially uncontrolled components.

Microfiche is expected to be able to accept any document, from European reports hectographed in pale purple ink on foolscap paper to journal reprints with 4 pt footnotes, photograph it, and distribute fiches which will pass through a variety of hands more or less used to handling photographic surfaces, finally to be read on a random assortment of readers in an even more random assortment of states of repair.

I contend that every step in the process is critical, in the sense that if one step breaks down the whole system breaks down. If the system can not be made to work at 18:1 reduction, it bodes ill for future systems which talk of even greater reductions. The answer seems to be unremitting quality control, not just in photography, as is now presumably being done, but at every step in the process, from original manuscript to the final viewer.

And even then I'm not quite sure that we may not have to wait for a generation to grow up that by habit is used to spending much of their time looking at images on a glass screen--that has no capital investment in the totality of physical and mental skills that go with reading old fashioned linear prose in black ink on good white paper. And to such old fogeys I offer the consoling words of Carl Overhage, taken from the 15 March 1969 Semiannual Activity Report for MIT's Project INTREX, a controlled laboratory experiment in information access if there ever was one:

"What will determine success or failure of microfiche or ultramicrofiche is the response of the user. It is not clear at the present time whether prolonged study of text materials on microreaders will find broad public acceptance, especially with mass-produced inexpensive equipment. The observable preference of today's library users for text on paper may continue to assert itself after much of the material stored in our collections has been converted to microform or magnetic tape."

CHAPTER II - BACKGROUND

Microfiche is a French word that describes a sheet of film containing microimages. As such, it is actually the oldest, as well as one of the newest, of microforms. When J. B. Dancer made his first microcopies they were on small glass plates with images arranged in rows. When Rene Patrice Dagron operated his celebrated "Pigeon Post" and set up the first commercial venture in microfilm he also used a plate having a series of images in rows. These applications, which were limited to copying, took place from approximately 1850 to 1870, and were followed by a period of inactivity which was to last for nearly 70 years.

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In January, 1939, Dr. Joseph Goebel, inventor of the first step-and-repeat camera for the production of microfiche, established the firm of Mikrokopie Verlag in the city of Mainz, "Verlag" means "publication." Dr. Goebel's purpose in establishing his unique firm was to republish in microfiche form rare and out-of-print works which otherwise would be unobtainable except at extremely high cost. One of the first works republished by Mikrokopie Verlag was Ars Moriendi, which had originally been published in Leipzig in 1945. By means of his step-and-repeat camera Dr. Goebel was able to produce master negatives from which inexpensive duplicates could be made in editions of a single copy or many copies and on demand. Works thus converted to microfiche were perpetually "in print." From its early uses as a copying method, microfiche came thence to be used as a means for photographic republication of existing originals.

Another class of material issued by Dr. Goebel's firm in microfiche form was manuscripts. Since, for the most part, manuscripts exist in only a single copy, the issuance of microfiche copies constituted a form of primary publication.

In addition to publishing on microfiche, Dr. Goebel also manufactured and distributed step-and-repeat cameras. As these and similar ones manufactured by other firms began to appear in the photographic

laboratories of European universities, particularly in Holland, Belgium, Germany and France, the use of microfiche for copying and duplicating became much more widespread. If a scholar or another library wished to acquire a book or a manuscript or a copy of an article from a journal, microfiche of such desiderata in an edition of one copy could be prepared quite rapidly and inexpensively.

Despite the advantages of microfiche, however, almost 25 years went by before microfiche began to be used in appreciable quantities in the U.S. A major breakthrough finally occurred in the 1960's when the National Aeronautics and Space Administration began to experiment with 5 x 8 inch microfiche as a means for distributing copies of the vast numbers of technical reports generated by that agency. This attracted the attention of other government agencies, each of which up to that time had its own methods for coping with the problems of distribution of report literature. The Atomic Energy Commission, for example, was using 3 x 5 inch Microcards to distribute their reports. At this point the desirability of uniformity of practice among the various agencies to facilitate interagency distribution was strongly apparent.

In September, 1963, an event took place in Washington, D.C., which was to alter markedly the course of microfilm history. The Standards Committee of the National Microfilm Association had been requested to cooperate with the government in establishing National Standards for microfiche. Accordingly, a meeting was held in Washington which was attended by experts from industry, the government, the library field and others. This was the beginning of a successful endeavor which, in the following year (1964), resulted in an agreement on the part of the government agencies to standardize on the international standard size of 105 x 148mm, and in the promulgation of standards for image size, reduction ratio, resolution and other internal aspects.

With the agreement on the part of the U.S. government agencies to standardize on the international standard size of 105 x 148mm (commonly normalized to 4 x 6 inches), international exchange of information on microfiche was greatly facilitated, and the use of this size spread to related European agencies such as the United Kingdom Atomic Energy Establishment and Euratom.

A round up in the United States on the sizes of microfiche in most prevalent use indicates that approximately 75 to 80 percent is on the 105 x 148mm size, about 15% to 18% on tab card size (3 1/4 x 7 3/8 inches) and the remainder is scattered among other sizes. In the most recent meeting of ISO it was agreed that the 105 x 148 mm size would be preferred.

As to the internal format, the U.S.A. has generally moved in the direction of two formats and the total amount of usage appears to be about evenly divided between them. The COSATI format uses a frame size of 11.75 x 16.5mm and the other uses a frame of 10 x 12.5mm. The former generally uses a reduction ratio of 18 to 20:1 while the latter as a rule, uses a 24:1 reduction. ISO has not yet recommended an internal frame size or reduction ratio.

The development of standards did much to extend the use of microfiche and to expand the market. NASA's output in 1963, when they were pioneering the use of the microfiche, was estimated at 3,000,000. Although it is difficult to get any grasp of size of the industry, a brief review of sources manufacturing microfiche in the United States indicates that with the expansion of the use of microfiche to other government agencies and the development of numerous applications in business and industry, current annual production, only four years later, is on the order of 100,000,000 microfiche. Where microfiche were once used almost exclusively for technical report dissemination by government agencies, they are now used in a variety of business and industrial applications such as parts lists, catalogs, maintenance manuals, airline schedules, directories, hospital records, product formulae and corporation annual reports. Other applications, some of which were formerly the province of roll microfilm but which soon may be done on microfiche include bank mortgages, insurance applications, county and title company records, pharmaceutical drug applications, and others. In the academic field, one journal is using microfiche for primary publication. Others can be expected to follow in the near future. Vast amounts of research material, including monographic publications in almost every field of knowledge and extensive runs of serial publications which formerly were available on Microcards are now being offered on microfiche.

Generally microfiche is made in one of two ways; either the image is photographed on 16mm film and the strips of film cut and arrayed in a jig or stripped to a form so that they may be held together for making a duplicate, or a step-and-repeat camera is used. The step-and-repeat camera is used for photographing rows and columns of images on individual sheets of film or on wide rolls of film. If the camera uses roll film the roll can be processed conventionally and cut into sheets afterward. In the past, European cameras generally used sheet film while the cameras recently designed in the U.S.A. have been designed for 105mm roll film.

Duplicates are made in two ways also. When the master is made by stripping up 16mm film the master or masters are usually duplicated by means of vacuum-frame contact printer. Diazo film is most frequently used as the copy film.

When microfiche is made either in a step-and-repeat camera or is copies from individual stripped up microfiche onto a roll of film, the roll may be duplicated in a roll to roll type equipment. Where large numbers are needed for distribution this often is the most efficient method.

There are advantages and disadvantages to the different methods of making microfiche but the trend in the United States appears to be in the direction of step-and-repeat cameras and roll duplication because of the emphasis on short-run publishing applications where numbers of copies are needed.

In the United States, certain information handling systems which employ a high degree of automation are using microfiche on film sheets which are the same size as tabulating machine cards (3 1/4 x 7 3/8 inches.) Another tabulating machine card (aperture card) application employs a single frame of 35mm roll film containing eight images. Where a system contains large numbers of documents which are eight pages or less in length, machine sortable microfiche of this type offer definite advantages.

While the emphasis in Europe, to a large extent through the work of the Microfiche Foundation, has been on the copying and republication

functions of microfiche and on library usage, the emphasis in the United States has been heavily on the use of microfiche for primary publication, duplication and dissemination of the documents of business, industry and government.

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(Foregoing extracted from "Microfiche Returns to Popularity" - W.R. Hawken and Carl E. Nelson, IMC Journal, 20-30, Fall, 1967)

On Choosing A Microfiche Reader, Or, Caveats For The Emptor.

One of my correspondents writes:

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I could not agree with you more regarding the "deluge" of fiche, though I would question whether because the fiche we receive is poor and the equipment still poorer that we should accept the view that users may express for not finding microfiche suitable for their needs. After all, the car was an abomination when it began (and is a worse abomination now but it is an accepted way of life!).

Unfortunately, neither Europe nor America have thought through the significance of introducing a new media of communication. They have not examined the standards that need to be achieved; appreciated the effect of environment; nor considered the varying needs of potential users.

This is exactly what this Centre is trying to do. We have already demonstrated that equipment is not designed for the purpose - it is just manufactured on the assumption that it will do. Standards, both American and European, leave a lot to be desired. Unfortunately, one questions the motives which inspire the standards.

Meanwhile, little thought is given to the total system - hence the

flow of substandard fiche with a user left wondering how he is supposed to read what he has been sent.

"Read" is of course a further misunderstood term. What a difference between "legibility" and "readability".

If microfiche is to be read, one needs a reader. And of the moment, the choice of readers is free enterprise, rampant on a field of less-than-happy purchasers of older equipment. The following guidelines cut across the specifics of make and model.

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Choosing a reader or reader-printer involves careful consideration of many criteria. First is the size of the microfiche which the reader will accommodate. The current international standard for microfiche is 4x6" but there are several million of the older 5x8" microfiche around. In addition there are still many European microfiche of 3x5" and 3 1/2 x 4 3/4" in existence. A reader capable of handling 4x6" microfiche will also accept the smaller sizes and should be satisfactory unless the user has, or expects to get, any of the NASA reports issued during 1962-63 on 5x8". In that case, a unit capable of taking the largest size is needed.

A second criterion deals with the compatibility between the reduction ratio employed in making the microfiche and magnification ratio of the reader. For reading microfiche of government technical reports, the problem is simple since all such reports are filmed at a standard reduction of 1:18 or slightly higher. A reader working at a fixed magnification of 18X would thus provide an image the same size as the original. A magnification close to this-say 15X-would still provide an easily readable screen image.

Magnification compatibility gets more complicated when the reader will be used to view materials obtained from a variety of sources. Both the original page sizes and reduction ratios may vary over a wide range. The user must ascertain what will be the maximum reductions of original material and what magnification he needs. His reader should provide him with the ability to handle this, perhaps by variable magnification or by the use of additional lenses where necessary.

A third consideration is the size of the reader screen. In reading microfiche of government technical reports, which are usually 8 1/2 by 11 inches, screen sizes somewhat smaller than 8 1/2 by 11 inches may be satisfactory, since the reports usually have adequate margins, and a screen image somewhat smaller than the size of the original may have no appreciable effect on legibility. In reading microfiche of other types of materials, not only are larger page sizes likely to be encountered, but the presence of small type faces may make it highly desirable to be able to project an image somewhat larger than the size of the original to enhance legibility. The problem here becomes one of convenience, since an image magnified to greater than original size may be too large for the reader screen. That the full length of the document cannot be accommodated on the reader screen has little effect on reading convenience, but if the full width of a line cannot be presented on the screen, the user is obliged constantly to move the microfiche back and forth to read each complete line.

A fourth criterion is that of image rotation. Both in government technical reports and in other printed materials, maps, charts, and tables frequently appear with the lines of text arranged vertically on the page. It is highly desirable that the microfiche reader have some provision for rotating the microfiche 90° so that the text on such pages can be brought into a horizontal position. If a reader is not so equipped, it may be possible to remove the microfiche and place it vertically between the glass flats of the microfiche carrier, provided that the carrier is large enough. If it is not, then the largest microfiche that can be positioned vertically will be limited, in most cases, to the short dimension of the carrier. For example, 3- by 5-inch microfiche can be positioned vertically in a carrier for 5- by 8-inch microfiche, but 4- by 6-inch microfiche cannot.

In addition to these criteria, it is also important that the screen image be sharp and clear from edge to edge and that the screen brightness be at a level which will provide for comfortable viewing under conditions of ordinary room illumination. A mechanical stage for moving from image to image and from row to row is convenient but usually adds significantly to the cost of the reader.

Key questions, then, for any potential buyer of microfiche readers and reader-printers include what is the maximum fiche size accommodated, what is the screen size, what is the magnification, does the

unit offer brightness control, mechanical state, image rotation.

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(Extracted from "Microfiche Directory" by Rodd S. Exelbert. Information and Records Management, 39-43. June/July 1968.)

And, for those who think the consumer has all the problems, I offer the following letter from a manufacturer:

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The major problems facing the manufacturer in the ever broadening micrographic field are:

1. How many different reduction ratios must the printer accommodate?

2. What price is the market willing to pay for additional printer flexibility?

3. Should the unit accept only microfiche or should other film forms be included, such as 35 MM roll, 16 MM roll, 16 MM cartridges, Jacketed film, aperture cards?

4. When will the industry establish definite standards of microformat and reduction?

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CHAPTER III

DEPARTMENT OF DEFENSE LIBRARIES AND MICROFICHE

I received 65 letters from Department of Defense libraries and/or librarians. Many of these (47) were either against microfiche, or had had no previous experience with it; 18 were for microfiche. This is a complete reversal of the ratio found with industrial libraries (40 for vs. 20 against).

Background

The introduction of user charges by the Defense Documentation Center on 1 July 1968 was apparently a traumatic event. I assume that it had a similar impact on all three services; some idea of the effect of this on Air Force users can be inferred from the following quotation, from the United States Air Force Stinfo Newsletter, Vol V, No 8, Aug 1968:

"HQ USAF LETTER ON USER CHARGES FOR DDC DOCUMENTS

1. A Hq USAF (AFRDC) letter dated 3 July 1968 concerning this subject was sent to all major Commands with the following information:

a. In the Defense Documentation Center (DDC) Digest No. 31, 6 May 1968, it was announced that, effective 1 July 1968, a service charge of $3.00 must be paid for "hard copies" of documents obtained from DDC. A copy of this Digest was sent to all DDC users.

b. The purpose of the service charge is to encourage the use of documents in microfiche form, and to reduce the ordering of documents not really needed.

c. Because of the very short notice and the estimated funding impact on ongoing programs, the Assistant Secretary of the Air Force for Research and Development requested DDR&E to postpone the service charg for at least one year in order to establish purchase of necessary hard-copy documents and the equipment needed to use microfiche documents.

d. The request was denied by DDR&E memorandum, 20 June 1968, and the $3 00 service charge was formally affirmed. However, the memorandum provides for consideration of requests for free hard-copy service to organizations in which there is an undesirable impact which cannot be corrected within existing resources. Such requests should

be submitted to the Air Force STINFO Focal Point, Hq OAR (RRY), 1400 Wilson Boulevard, Arlington, Va. 22209, and should include full justification. Screened requests will be forwarded by Hq OAR (RRY) to DDR&E for final approval.

e. Since no Air Force funds have been programmed for this purpose in FY69, it is necessary for all organizations which use DDC documents to take steps to minimize the impact of the service charge both on program funds and on the flow of scientific and technical information.

2. All Commands were advised to encourage or require contractors to use microfiche documents rather than hard copies; to establish internal procedures to avoid ordering unneeded documents in any form; to establish an optimum balance between the use of hard-copy and microfiche documents; to determine funding requirements for the purchase of hard-copy documents and microfiche reading-and-printing equipment, and to include these requirements in the next budget revision.

3. In message ALMAJCOM 1152/68 dated 17 July 1968, the following additional information was contained:

a. In those exceptional cases where an emergency situation exists, Air Force users of DDC are authorized to submit the DDC Form 1 directly to DDC requesting free hard-copy service. Such requests must be accompanied by a letter certifying that:

(1) There are no funds available locally to purchase documents in hard copy.

(2) The document is required for mission accomplishment.

(3) Microfiche reader-printer equipment is not available.

(4) An information copy of this letter will be furnished to AFDASBA, Hq USAF.

c. Authority to obtain free hard-copy service under these emergency conditions will be terminated on 15 Oct 1968."

DoD Libraries that approve of microfiche

The outstanding showcase for the use of microfiche in a Department of Defense Library is the Naval Weapons Laboratory, Dahlgren, Virginia. Some of the reasons for this success are apparent in the following excerpts from a report, "Microfilm usage in the technical library at Naval Weapons Laboratory" by Cathryn C. Lyon (NWL MAL-1, 1 Dec 1966).

"In 1964, the Technical Library made plans for moving into newer, more spacious quarters. While making these plans, it was obvious to the Librarian that in two years the accumulation of documents, books, and periodicals would again be a storage problem.

The Librarian and the Library Advisory Committee asked the Management Engineering Staff to assist them in a study of the use of microfiche for the library. The study that we requested was conducted and included visits to the only users of microfiche in the Washington area at the time. They were NASA, AEC at Germantown, and a future user, DDC. The Library Advisory Committee in preliminary discussions had stressed the need for making the use of microfiche completely convenient and comfortable for the user. The study was intended to help us learn how microfiche was produced, reproduced, and used. An interesting thing became glaringly obvious--none of these agencies were equipped with enough readers to make the use of microfiche convenient. In fact, at the time one agency had only a large reader-printer in the library which appeared to be used solely for reproducing hard copies--not for reading purposes. We were convinced that the Advisory Committee was correct and recommended in our report to Laboratory Management that we would need ten (10) portable readers for the laboratory as a start. We have since purchased the following and recommend this equipment as satisfactory: (or equivalent equipment)

1.	10 Dukane Portable Readers	@152.20	$1522.00
2.	14 Doc. Inc. Portable Readers	@159.50	2228.00
3.	1 Filmac 400 Microfilm and Microfiche Reader-Printer in Main Library.		1073.10
	Microfiche Attachment		215.00
4.	Microfiche Copying Equipment (Kalvar)		
	Printer		596.00
	Developer		300.00
5.	Filing Cabinet for 4x6 Microfiche (GSA)		91.50
6.	Filing Envelopes (for holding Microfiche in cabinet) (Microcard Editions, Inc.)	@6.00 per M	60.00
	TOTAL		$6323.50

Because of the resistance of research people to using microfilm, we felt that we should conduct several sessions in which we explained the need for using microfiche, and the advantages. As we placed each of the first portable readers, we itemized the following and answered questions:

NEEDS

1. To increase storage capacity in the library without adding space.

2. To eliminate myriad filing cabinets of hard copies in storage in various individuals offices.

3. NWL is geographically remote from information centers and it is necessary to maintain an extensive working collection for prompt availability. This can only be done if storage capacity is sufficient.

USES AND ADVANTAGES

1. Duplicates are made of master microfiche and are circulated without being charged to the individual. They are expendable. This is true for the unclassified. The Confidential and Secret have to be accounted for.

2. When several requests come to the library for the same document, copies can be sent immediately of microfiche to all requestors, thereby allowing him to receive the document immediately and not have to wait his turn to see a hard copy.

3. One thousand (1000) microfiche will fit in a filing drawer on a man's desk as compared with a 2 1/2' by 1 1/2' filing cabinet.

4. Can reduce bound journal back files when these are finally available on microfiche thereby allowing storage for a greater collection of journal literature.

5. Ratio of shelving in library to microfiche drawer space is 140:1.

The education process to promote usage of microfiche is a continuing one. Acceptance has been very good by the NWL staff. However, when there are problems, it is because the microfiche copy is poor. Agencies who produce these need to staff their operations for accuracy in copying that will reproduce good tables, graphs, and diagrams, as well as text. If some mathematical notations are obscured, it can change the whole problem. These poor microfiche create our only user problem.

Originally, we had planned to purchase portable reader-printers when they were available. However, it seems to satisfy the users needs to have a handy reader and the knowledge that a reader printer is available when needed. It seems that discretion is the better part in this case and encouraging copying will create again the hard copy storage problem in individual offices.

Certain costs savings can be documented while an estimation of the value to the borrower of prompt access to reports can only be assumed. We have thirteen thousand (13,000) microfiche documents in one filing cabinet. All of the document distribution from NASA comes on microfiche and all of DDC and AEC reports are requested to be on microfiche. Roughly about *50 filing cabinets in offices can be discarded making the following savings:

I.	13,000 documents would require 18 sections of shelving		$ 3034.00
	Floor cost if 18 new sections of shelving had to be placed	@25 per ft.	3375.00
	Floor space saved by eliminating *50 filing cabinets 2 1/2'xl 1/2'	@25 sq. ft.	4487.50
	TOTAL SAVINGS TO DATE WITH MICROFICHE		$ 10856.00
II.	Cost of filing cabinet		91.50
	Cost of floor space for cabinet	@25.00	89.75
	Other equipment (minus cabinet)		6232.00
	TOTAL COST OF MICROFICHE		$ 6413.25
	Savings		$ 10856.50
	Costs for equipment, etc		6413.25
	TOTAL		$ 4443.25

These figures indicate that we are about four thousand dollars ($4000.00) ahead by having installed the use of microfiche. They are the obvious. The value of having enough information available and room for it when it is needed for a research problem is hard to estimate. But in emergencies like the present conflict a delay in obtaining reports or manuals can mean the delay of effective support to the war effort. Who can evaluate the cost?

Other DoD libraries, though with perhaps less experience, have adopted similarly positive approaches to the introduction of fiche. One writes:

"Before meeting with the ad hoc committee to study the use of documents in fiche, the Library distributed "packets" of information to committee members. These included: Sample microfiche; Fiche reproduced into hard copy on our Filmac 400; Leaflets on various portable readers; Background information on microfiche usage. The sources from which this information was taken include: Reproduction Methods for Business and Industry, vol. 6, no. 5, May 1966. "A Microfilm Primer."

Price, Douglas S. The introduction of microfiche for disseminating technical information in the United States. May 1966.

System Development Corp. Calif. Library Fiche: An introduction and explanation. Arthur Teplitz. Oct. 1967.

Tate, Vernon D. and David R. Wolf. A Survey of microfiche readers and reader printers currently manufactured in the United States. May 1968.

The committee proposed certain steps to make a transition to greater acceptance and use of fiche by staff easier.

1. Simultaneous ordering of hard copy and fiche copy. The Library will retain fiche for permanent copy so that it will be immediately accessible for future users. Since faster service is received on orders for fiche copy than for hard copy, the user will be given the option of using fiche copy if he is in a hurry to read the document.

2. A sufficient number of portable fiche readers should be made available for research staff on demand.

3. A high speed, large capability printer should be obtained and located in the central reproduction facility at XXX, to provide hard copy on demand."

Students at service schools do accept fiche

"We at the Academy Library have had DDC microfiche for about three years as well as some other publications on microfiche. As a money-saving feature, microfiche has been accepted especially when you can produce a copy immediately for the researcher who might otherwise have had to wait two to four weeks or longer to obtain a copy. As a storage medium, microfiche is obviously space and therefore money savers to a library or research office which must build substantial report research files. Use of microfilm and readers has been accepted for many years in storage of newspapers and hard to store or unobtainable publications used by library patrons and researchers, and microfiche

is only a different form of reduced storage. So long as the number of items printed continues to grow, reduced storage will be the only good answer to the demands placed on libraries and research centers. The researcher will have to accept it if his convenience needs can be met in part.

As an educational institution, we feel it is our duty to expose our faculty and cadets to information media in all formats. In our library orientation sessions and in our classes on research methods, professional members of the Library staff explain and demonstrate the use of microforms. During these periods, we attempt to tear down the psychological barriers which some people have when it comes to using new informational media. It has been our experience that cadets who have used microfiche during some of their independent research courses really enjoy using it. The same is true of the younger officers. The senior officers share the bias of their counterparts in science and industry for hard copy rather than microfiche or microfilm. I believe it is all a matter of conditioning."

"Our most demanding customers for retention of hard copy reports were the professors at AFIT, who placed them on their office shelves for reference purposes. Reports were often put on the library "reserve" shelf by an instructor as supplemental reading and sometimes in multiple copies.

AFIT students generally accepted the use of the microfiche. Apparently, they were never told this was not normal procedure. Further, they were young, adaptable, and less set in their ways.

These students were encouraged by the librarian and the professors in the English Department to take notes when doing research and reproduce only items for which notes could not be taken, such as graphs or charts. I do not recall any student reproducing an entire report on a reader-printer. Once in a while it was necessary for the library to reproduce an entire report, not available from DDC, for the reserve shelf."

"The reaction to the news that DDC would provide (free) only microfiche and would charge for a full-size hard copy was anything

but good. This substantiated our experience with the use of microfilm. Most instructors will go elsewhere in search of their information before using microfilm. Midshipmen, however, having no real choice because they desperately need the information do use the microfilm without grouching too much."

As do scientists and engineers at some in-house laboratories:

"Situation: Business library maintained for AF officers (Missile) studying for Master's degree in Industrial Management. No. of personnel involved - approximately 100.

Microforms: Much prefer fiche over roll film (I wish periodicals were available in this form). Easier to handle, store, file, and retrieve. I affix a pressure sensitive label containing necessary information to front of envelope fiche come in and file them alphabetically by author in small steel file. All are indexed in the card catalog just as a book is with appropriate subject headings. Instead of a call number the cards are marked

Micro
Smith (Last name of author)

DDC roll film: Does not have sufficient blank lead film to fit our reader. At least 12" on either side of material to be read is needed to reach from reel to reel. Film is often a fraction of an inch too wide to fit reels or between rollers of lens attachment, thus causing films to bind and get chewed up on edges. These problems do not seem to exist with microfiche which is of uniformly high quality.

DDC hard copy: Often poorly reproduced to the point of being practically illegible. Subject to quick dilapidation in ordinary use. At $3.00 a shot, we will not be using any more of it.

General: DDC is to be commended for switching to fiche. With a minimum of explanation to users and availability of readers, it should find wide-spread acceptance. Here in this AFIT library, we find it extremely satisfactory . . . and we like the price. We have some fiche from other agencies and a considerable amount of roll film from University Microfilms but would be glad to see it all on fiche."

Some DoD libraries find that their users don't regard microfiche as an unmixed blessing:

"In reply to your letter of 5 July 1968 regarding our experience with microfilm and microfiche, we have been using these microfilms for the past five years for technical reports. Reports more than five years old are available to library users on microfiche or microfilm only. Therefore, library users do not have any choice as to the form in which reports are available.

Some of our users find the microforms satisfactory. However, large number of library users prefer the hard copy and the reader printer is used to provide hard copy. In most instances, the full text of the report is produced."

As do scientists and engineers at some in-house laboratories:

"The NRL Library is one of the members of the DDC Microfiche experimental program and we have been receiving reports on microfiche since January 1968. Our patrons have been very cooperative and have accepted the use of microfiche with a minimum of complaint."

"Although we have some 8,000 documents on microfiche in our collection and several thousand in other microforms, our engineers have not actually started using these to any extent. Naturally there are a few who simply don't want to change their habits but most of those with whom I talk recognize the convenience in storage and the advantage of not having to return documents to the Library. (We anticipate getting a fiche reproducer so that it will be cheaper to give the microfiche than to loan a document). Their question is, "How about readers?" We have four readers for use in Bldg. 17 and have one reader ordered for each Division of the Laboratory. We will need more but this is a start.

Through our contract we have given an extensive trial to five of the available readers. Our conclusion is that even the cheaper ones are not bad but for regular use one at about $160 is worth the extra cost. The girls like one at $125 as a source for typing. Our Records Management Group has arranged a display of available equipment so that people at Wright-Patterson will be able to evaluate for themselves."

"The library has a good collection of hard copies of NASA and AIAA publications as well as technical reports of WPAFB laboratories and selected documents covering the Laboratory mission. The loan period for their use is very flexible. In the last year we started building a collection on microfiche. Our engineers didn't take too kindly to the microfiche editions, but since there was no reader printer available for routine reproduction of pages in volume. the resistance lessened.

When DDC instituted its new policy, the circulation of the hard copies available in the library increased as well as the use of the reader for the microfiche that was obtained by the engineers' office for him from DDC."

"Mr. Jorgensen and Mr. Carlson have asked me to answer your inquiries concerning the acceptance of microfiche by our Library users, since I was the librarian most directly concerned with the DDC pilot project of automatic microfiche distribution last spring and am presently involved with the microfiche reports received by order from DDC.

First, a word about the automatic distribution project; we ran a story in the station paper explaining the project and announcing the availability of microfiche reports. In addition, we listed the reports most pertinent to the Center's work in our weekly Acquisitions List. Response was very poor: less than one percent of the potential audience showed interest in the service. Those who did use it complained primarily about the poor quality of the image displayed by the reader and inconvenience of using it. Some indicated also that they would not be satisfied with a system which required use of reports in the Library rather than in their offices.

User attitude has not changed. No one for whom we order reports has chosen to receive a microfiche copy in preference to one of full size. Most are not even willing to look at the microfiche on the reader to determine whether a full-size copy would be worth three dollars."

"However, the distribution of microfiche in place of full-size copies has created problems for us and made us less likely to request reports from DDC in the future. The fiche are not subject to cataloging

and handling in the same way as full-size reports. If any extensive use were to be made of microfiche (unlikely, judging from response so far) we would have to develop a separate system for cataloging, charging, and storing the microfiche reports. The white and black print of the DDC microfiche not only makes reading difficult but probably will prevent us from obtaining a Xerox combination reader-printer and copier, which appeared to be the best solution to the problem of providing full-size copies. This combination requires a positive fiche to print from. Finally, the difficulty of control and accountability of pages reproduced from classified microfiche can be expected to cause all sorts of security problems.

Except for a few fiche from NASA our experience with DDC has been our only contact with microfiche. From observation of our users' reactions, and from analysis of our own, we find no demand for expansion or indeed continuation of microfiche distribution from DDC."

"The SCAN evaluation and the GAB study of microfiche acceptance by the user showed a 50% resistance to the use of microfiche in place of hard copy. There were two major reasons given; first, the preference to take hard copy home or to an office for private study, and second, the poor quality of the microfiche.

Users who accept microfiche are enthusiastic about the space conservation and the practicality of printing in hard copy only pages, tables and graphs of particular interest. However, these users also complain about the poor quality of the microfiche. The most common criticism was against the reproduction of pictures or equations which appear blurred or indistinct."

"All reaction has been negative or very mildly positive.

Ability to 'comfortably' browse is highly desirable; microfiche and its readers leave much to be desired.

Many microfiche are negative (for obvious reasons); reading them is very tiring on the eyes.

Most engineers and scientists want convenient hard copy to take to their desk, their lab, their home; microfiche does not satisfy this need.

Specific quotes have been as follows:

'I want a hard copy; hang the cost. My time is more expensive than what you save by using microfiche.'

'Making the field office pay more per copy than it would cost to do it at DDC or the source is a heck of way to economize.'"

"People who have used microfiche generally become accustomed to it. I'm sure most would admit it is more convenient as far as usage. This disadvantage is somewhat offset or diminished by the fact that more information can be made available in a library that otherwise would not have it. Most customers will want a hard copy of a page or pages, which at present, because of the lack of demand, is more costly from fiche than hard copy.

Microfiche definitely has a valuable role to serve. At the present it appears that this role is primarily for material that is important, bulky, consulted occasionally, but not needed as a daily or as intensive reading requirement. The storage of bulky, but not frequently consulted material, gives microfiche an advantage over hard copy. This advantage is somewhat offset by the need for filing cabinets and the need for clerical filers of the fiche. Fiche on IBM cards that can be machine stored may solve the filing problem."

DoD libraries against microfiche

For many DoD libraries, the DDC decision to impose user charges was their first exposure to microfiche. Typical reactions were:

"Microfiche the sixty four dollar question: Our Engineers here at XXX still have the experience awaiting them in dealing with microfiche. This encounter will take place as soon as the orders placed have been received.

Speaking as a librarian and with my past experience, I have yet to encounter a scientist or engineer who will readily accept it. It has taken many indoctrination sessions before many of them will even view it.

Their main objective is the time involved in trying to get access to the viewer in spite of the fact that there are many of them around in the department. In trying to eliminate this phase of the program, portable viewers were purchased, but then that is another story again."

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"In reply to your letter of 5 July so far as we know to date, the scientists and engineers on our staff do not wish to use the microfiche for study. Some are willing to scan it, and print out particular pages, charts and diagrams as needed.

We shall probably continue to order hard copy of lengthy reports and documents in which illustrations are important. The cost will not be as important as the cost of time involved in making enlargements."

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"We have very little microfiche - more roll film. We are just starting to acquire microfiche as a matter of policy, and have also acquired a 3M model 400 Reader-Printer with a microfiche attachment.

As far as the roll film is concerned, the Reader-Printer made all the difference in the world in acceptance. Instead of our students groaning and deciding their need is not great enough to warrant hand-copying, they are now pleased to see that they can make a copy of what they want. We expect the same reaction in the use of the fiche. Incidentally, the students usually do not reproduce the entire text of what they want - just an occasional page.

What we already have on fiche are: records of the OAS, which started out on microcard, then became 3 x 5 fiche, and now the standard 4 x 6; a classified periodical, Hollerith card size; and odds and ends from DDC."

"In reply to your letter of 5 July 1968 re. the use of microfiche, our library has not yet needed to adopt a microform for technical documents. However, in several years we shall need to - for the obvious space problems.

It is my strong feeling that hard copy should be provided the user as long as this service is at all practicable. We shall continue to request hard copy from DDC -- despite the user charge -- which does indeed seem to discriminate against the non-microform user.

I trust that by the time our library is required to convert to microfiche the "bugs" in the system will all be worked out; i.e. better equipment, better quality fiche (especially for illustrations), etc. I think the librarians should make a strong plea for - and insist on - top quality production/reproduction. It is asking a lot of the user to expect him to accept a microform rather than hard copy. To then give him a poor quality product is indefensible.

Since I have an "ear", may I add that your assignment from Col. Aines does seem rather after the fact, doesn't it. It is most unfortunate that this study could not have been conducted before the DDC decision. And worse yet that the DDC decision comes at a time when much work on the technology remains under development."

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At present the Army XXX has no microfiche productive capabilities. We do, however, receive microfiche from NASA and CFSTI (Clearinghouse), despite asking for hard copy in each request. Our only means of reproduction is by reader-printer (Itek Model R-F), a slow and costly procedure.

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Unfortunately my organization has no fiche facilities, either for reading, storing, or reproducing, and none is available within a 2-mile radius. In order to properly serve our library users, we would have to purchase a reader-printer for the library building, plus 3 or 4 readers which would be available on a loan basis. Needless to say, funds are just not available at this time. Until our budget is increased, we will continue to buy the hard-copy reports and reproduce them locally as required.

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In reply to your letter concerning the use of microfiche, we do not have the proper attachments to our reader-printer to use microfiche at present. We hope to buy this equipment, and an additional less

expensive reader, when funds permit. This requirement has been brought about mainly by the Defense Documentation Center charging for hard-bound copies of their documents as of 1 July 1968. Several instructors have been unhappy not to receive documents free, and it will curtail the service for students until we have the proper equipment to use documents on microfiche. For research purposes most individuals do prefer to have the document in hand because they are not tied to the reader to view the information.

As of this date, USA XXX School Library has not used microfiche to the extent that we can be very helpful in your survey. We have on hand only 60 documents on microfiche. However, now that DDC no longer provides hard copy gratis, we expect to obtain much more material on microfiche from DDC.

We have an attachment to one of our reader-printer machines which converts to the use of microfiche, but it is a nuisance to put the attachment on the machine. Only two members of the staff have learned to put the attachment on correctly.

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Our Technical Library has ordered a Microfiche Reader-Printer and three microfiche readers to adapt to DDC's policy.

We have had two specific reactions to microfiche to date--the first is from the local representative of a contractor who has ordered several hundred -fiche. He is a scientist, a bookish type. The second was from a junior officer who said "skip it," when microfiche copy was suggested.

I recall that in the middle fifties ASTIA was distributing micro-cards. We accumulated some 20,000 or 50,000, which were discarded about 1960 for lack of use. Of course the microfiche are an improvement on the microcards and permit reproduction to full-scale.

To date, we have spent $2000 on equipment and set up a deposit account of $1800 with the Clearinghouse. Last year we ordered approximately 3600 reports from DDC.

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The US Army XXX School Library has had practically no experience with microfiche. One of the instructors had received a DDC document on microfiche and brought it to the library to read it on our reader/printer:

a. It took a few minutes to set up the microfiche attachment. This was the first or second time it had been used.

b. The instructor read the document and printed the few pages he was interested in.

c. He left the microfiche with the library and we are at a loss as just where to "file" it for future use. We have no storage trays for the fiche.

And the combination of microfiche, Air Force procurement regulations (which discourage payment in advance) can produce sheer frustration, as attested by the following letter from a major Air command:

"In reply to your letter of 8 July 1968, the acceptance and use of microfiche at HQ XXX can only be described as negative. Because of space limitations in the STINFO Library, we have converted some of our older and less frequently used documents to microfiche. When someone is required to review material contained in such documents and finds he must use the microfiche reader, his reactions have in almost every case been unhappy. Frequently, we have been requested to get the document back in hard copy form. Using the microfiche reader which we have is time consuming, requiring concentration and a steady hand to move the reader from one page to another. If there was an automatic feeder with a button to push when the user wanted to go to the next page this would be a big help. However, I do not know of any equipment like this, at least not within a reasonable price range. In any case, so far as I'm concerned, it would be impossible from the standpoint of extra time required, to catalog in the depth we need directly from microfiche.

We do not have a microfiche reader/printer in the headquarters and the only microfiche reader is in my library. The main reason for

not having a printer, outside of the fact that both the original cost and the cost of printing are very high, is the lack of manpower to do the printing, the controlling of all classified documents being printed, and the binding when required. There does not appear to be any possibility of getting additional manpower at the present time and my small staff could not undertake the additional workload which would be required. When I made a headquarters-wide survey to determine how much money should be requested for this fiscal year for the purchase of DDC documents under the new procedure, no one wanted to consider buying additional microfiche readers and no one wanted to rely on using our microfiche equipment, particularly for documents they had not seen previously in hard copy form.

We now have a backlog of requests for DDC documents to be ordered and some rather unhappy library users as the result of the new procedure. While I was able to get money set up in the XXX budget even on short notice that we had, we have only this morning (after many long distance calls and teletypes) been advised as to what Air Force Manual authorizes the expenditure of funds in advance. The XXX Finance Officer still has to agree that this is adequate authority and approve of the procedure which I wish to follow so, hopefully, within a few more weeks we may be able to start ordering DDC documents again. So far as I'm concerned, this new directive cannot be classified as progress."

The proponents of microfiche might well argue that it is the job of librarians and documentalists to re-educate the users to accept the new "facts of life". Those who have not lived with microfiche, the argument could continue, are not really entitled to an opinion. However, it is possible to live with microfiche and still dislike it, as the following letter shows:

"In March 1966 I procured a 3M Filmac 400 reader-printer and a microfiche cabinet for our Documents Library. We had run into a few instances when technical reports that we wanted were only available on microfiche. I also had in mind the possibility of some reports of reference value, but not used too often, being kept in microfiche form.

In the fall of 1966 when DDC closed their field offices and were looking for a recipient (fall guy) on whom to graciously bestow (dump) their field office holdings, contrary to the library staffs' recommendations and our then General's reaction, the holdings of the DDC field office at WPAFB were acquired by our Center and placed in the Documents Library.

These consisted of: a Diebold Power File (to house the microfiche), a Kalvar Printer Developer (which reproduces microfiche from microfiche), five 3M100 microfiche reader-printers and about 67,000 microfiche (DDC's holdings from 1964 to 1966 less controlled documents). The equipment was pretty worn and beat up. The five reader-printers were distributed around the Center. Subsequently the Center Records Officer acquired thirty Atlantic desk microfiche readers and these also were distributed.

We were instructed from that point on to order reports only in microfiche form from DDC, NASA, and AEC, although we did continue to receive hard copy reports on initial distribution.

The attempts to force our engineers and scientists to use microfiche, in my opinion, have failed. Only two of our users seem to accept it and even these two will not rely solely on it.

Daily we have an experience which breaks my librarians' hearts. Our users come in or call up for information. We research and locate it. In those instances when they are told we have it only on microfiche, the reply is "forget it" usually accompanied by an emphatic wave of a hand. I shudder to think what long range effects this may have on our technology.

As you undoubtedly know, the reader-printer is not designed for wholesale reproduction (too costly and difficult a method) but only for an occasional page or two, a formula or graph for instance, the theory goes.

If our users are desperate enough for the information they will sometimes reproduce whole documents (cussing the while, of course).

Prior to 1 July 1968, another of their ways to circumvent the forced use of microfiche was to take the AD number from the library copy

of the microfiche and order hard copy from DDC by using their own DDC user codes.

Another means they use is to call up a contact at the originating agency of the report and see if they can't obtain an original hard copy print from source.

For all the touted economy of microfiche, I would like to have as income, the difference between the cost of these circumventions (some of our engineers and scientists are well paid and I'm considering the time they spend) and the cost of procuring the hard copy they want in the first place for them.

Our engineers and scientists are not only well paid but they are also smart. It really doesn't take them very long to figure a way around a system or a medium they do not like. If some of the present circumventions are blocked, I'll wager that they will find a solution.

I seriously think that it is a tragedy that they either do without the information or resort to these methods. I can see no benefit to anyone in this situation unless it is solely that to suppliers, like DDC, for whom it is evidently easier to produce microfiche.

Beside the obvious reasons why engineers and scientists do not like microfiche (they want to take reports home, on travel, they want to study, not just peruse them, etc) I have wondered about actual physical and psychological effects. I would like to see a Human Factors, behavioral type study done on using microfiche. I have researched, but have found no such study made. Eye strain, of course, is an obvious factor, but I suspect there are others.

It appears to us that the more creative people have the strongest objections.

In my opinion, microforms (including microfiche) have their place and could well serve a purpose. From my experience, and observations of our users, I would say that this is a good medium for archival and reference type material that is stored for reference. But for

initial and current usage it is not acceptable to the majority of engineers and scientists. Once our engineers and scientists have studied a report (and, after all, why shouldn't they be comfortable while they are doing it - you can't put your feet on a desk, tip your chair back and read microfiche - more of my suspected human factors), they retain the gist of it. For later or occasional referenc to something they have already read or studied, microfiche would probably serve.

The majority of the microfiche we have are not good copies. I would not classify any of the readers or reader-printers as good. The only microform reader I have seen that I would classify as good, is a large console type Swedish one for microfilm only, not microfiche.

I'm glad you asked only what our users' reactions are to microfiche and not what librarians' reactions are. I wouldn't dare write what catalogers and reference librarians who have to use them think.

CHAPTER IV

IMPACT OF DDC USER CHARGES

The impact of DDC's decision to charge users $3.00 for hard copy has already been discussed in the chapter on "Department of Defense Libraries and Microfiche" as it affected Department of Defense libraries. DDC users also have strong opinions on the subject, as attested by the following excerpts from their letters:

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I am the manager of the Air Force System Command, XXX Handbook. I manage the collection, organization, and distribution of information needed to support this handbook. I am currently working on ways to improve information presentation methods.

The DDC "Take Microfiche or Pay" decision left me in the position of not being able to pay for the hard copy or conveniently use microfiche. This situation hasn't changed and, as a result, the effectiveness of my program has decreased.

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I feel that these forms of government economy are definitely detrimental to good information dissemination and hence to efficient use of research time and talent. I hope that the decision for microforms as the "encouraged" means of information dissemination is soon reversed. I also wish that selective information dissemination of hard copies of current reports were available to research workers. A method should be devised to permit research organizations to be placed on the primary distribution lists of report orginators if CFSTI is no longer able to provide this service.

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With the latest DDC policy, I have told the managers that they would be expected to order microfiche documents, and that no hard copies would be ordered unless the engineer had examined the document in microfiche. Ordering from DDC has dropped from roughly 150 documents per week to less than five per week. In a couple of months I'll have better data.

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In view of these criticisms, I would like to express concern that the investment of the government in microfiche not be exclusive and at the expense of good hard copy services. For example, many users of DDC equipment find difficulty in acquiring a microfiche reproducer which costs $1400 +. The ability to order hard copies of short reports or selected pages of any report at prices below the $3.00, uniform charge, now levied by DDC and the Clearinghouse will not penalize small firms and small educational facilities in their opportunities to recover government information.

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My program costs are increasing. The contractors are passing along their increased costs for hard copy. If I require them to use microfiche, I would probably end up paying for the required equipment.

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"I feel that the user has the right of approval. In the past I have found that about one out of ten documents ordered from the pertinent abstracts actually contained useful information. The rest were garbage. On the present system, this means that each useful pertinent report costs about $30.00. I say, let me look at it first; if it is worth $3.00, I'll pay for it. If not, I'll send it back. Otherwise, we will get no benefit from DDC since this university cannot afford $30 for each pertinent report, i.e. we will not order any. Micro-fiche is out of the question for our use." (university prof.)

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"We expect to continue ordering documents but it is straining our budget. We had to obligate 'equipment' money to buy a book of coupons." (university dean)

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"Information is our life-blood. We must continue getting DDC documents to continue our work for the government. Micro-fiche doesn't present a substantial savings since we must assume that most of the time an investigator will look at one or two pages, then ask for all of it to be printed. We are heavily screening our requests now, which probably costs more in manpower than the hard-copy cost. Also it costs more government man-power, paperwork, and time. Since most of our work is for the government, this increased expense will necessarily be passed back to them in increased overhead costs." (analysis group manager)

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"Seems to me that DDC has forgotten that they were originally established to serve the scientific communities associated with the government. They have become so involved with information storage and retrieval that it has become an end in itself to them. In order to be more efficient and progressive they have sacrificed the beneficial service which was the only reason for their existence." (research group manager)

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Comments: I have been in defense work for fifteen of the last eighteen years. My particular specialties have been systems development, systems analysis and, at the present, value engineering. I have always relied upon ASTIA and, more recently, DDC for a great deal of my information regardless of the source, USAF, Army, or Navy. In my present capacity, value engineering, we screen a large amount of information, from vendors, periodicals, and DDC. Much of it is discarded as being impertinent, misleading, or gobbledygook. Approximately one out of ten DDC reports contains usable information regarding research, development, production, test, operational or requirements which can be applied to any item of defense hardware. The present $3.00 price ticket on a hard copy makes the situation more difficult because it places an additional load on the user's budget, government and contractors, as well as from the standpoint of time.

It would be ideal if hard copies were made available to qualified users, government and contractor directly involved in a defense effort, of any information obtained as a result of a present or past contract by any of the three services.

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The cost factor also has two sides. Microfiche shifts the cost from one source to another. DDC may be able to produce copies cheaper, but libraries with the service must consider filing cabinets, readers, reader-printers as well as clerical filing. Whereas with hard copy the user can take the material out of the library, with microfiche, at present, he must use the material on the spot and occupy library space.

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Ordering $3 hard copy from the Clearinghouse is not helping the scientist or engineer. Many reports are worthless, inaccurate, and out-of-date. There should be more careful evaluation of reports accepted for sale on this basis. In addition the engineer and scientist is limited by what he can order and he might have to seek approval for purchase, prepare or sign requisitions for purchase plus wait 3 or 4 weeks before the Clearinghouse mails it. In the past, their service has not been good. DDC and NASA service has been excellent in the past. The engineer will accept the microfiche in preference to paying the $3.00.

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The system of charging $3.00 for printed copies of government reports introduces new obstacles to the acquisition of defense-oriented literature at the level of the working engineer. There are two factors to be considered. One is the extra procedures normally entailed in the procurement of cost items. In most engineering departments, management approval is required each time a cost item is obtained. The other factor is the impact of the document costs on the budgets of working level departments that use considerable outside literature. When budgets tighten,

costs for all outside services are scrutinized more carefully, thus further hampering the engineer who needs free flowing sources of information.

The microfiche system is just one more step in the current trend toward reducing overhead costs in the defense establishment at the expense of engineering efficiency. This trend appears to be caused by developments in the efficiency of accounting procedures, in government especially. Those cost items which lend themselves to such accounting procedures then become increasingly important. On the other hand, engineering effectiveness has thus far eluded the accountants. Therefore, if common sense did not have some sway, engineers would by now be doing all of their own typing, filing, mimeograph work, mail carrying, transport themselves between distant buildings, etc. It is getting this way, but fortunately has not yet arrived at this eventuality.

In the opinion of this writer, if the cost of the loss in communication efficiency of the new system (and consequent reduction in engineering efficiency) were added to the additional accounting expenses entailed by both the purchaser and seller of the hard copy reports, the total cost of the new system would far surpass the amount saved at the document source. It is hoped that the microfiche system represents only a brief backward step in this age of fantastic development in the science and art of communication.

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CHAPTER V

GOVERNMENT LIBRARIES AND MICROFICHE

Unlike the Department of Defense, AEC and NASA have been distributing microfiche for at least six years. It is not surprising that their libraries have acquired a great deal of competence in dealing with fiche and its attendant problems. All libraries of AEC and NASA, and their major contractors responding were in suitably qualified favor of microfiche. Other Federal libraries were more evenly divided, with 7 in favor of fiche and 5 against.

Libraries that have used fiche speak.

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We prefer the microfiche as a space saver. Under the TID 4500 distribution, we receive many reports not of direct interest and, as microfiche, these can be stored economically. Those of interest are either printed out in our office or they serve as a basis for ordering the full size report.

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The engineers at PB are getting accustomed to using the fiche. Circulation and use has more than doubled in the past 2 years. The fiche save time, money and effort simply because the men often only want to scan a report because the abstract has not given enough information. Since our library is small and compact, they save much needed space. As of this time, the men have not started any personal files. We have a reader-printer which has given us much mechanical trouble, but is a "God-send" in theory. We can reprint any of our fiche. We are now interested in getting portable readers to be used on check-out basis to increase use of the fiche. They are a definite asset to this library.

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This form of technical information dissemination is space saving, easily filed and retrieved, readable and can be reproduced. The

personnel of this office when informed, read the microfiche report and then request, only if needed, a reproduction or a hard copy. I have a reader-printer (the early 3M Model) and I can locally reproduce pages or small quantities of reports as needed. Any reproductions I make are usually given to the requestor without charge. Since the majority of my requests are from agency personnel or contractors, general public requests are fulfilled only in rare instances.

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The KSC Library is part of the NASA information system and as such receives all of the microfiche distributed semi-monthly by NASA, the Scientific and Technical Information Facility (SATIF), and the American Institute of Aeronautics and Astronautics (AIAA). We also receive AEC and DDC microfiche.

On the whole, the reception of the KSC Community to fiche has been satisfactory. It is interesting to note here that the younger age group of library users (scientists, engineers, and technicians) seem to accept the use of microfiche in lieu of the hardback copy more willingly and readily than the older age group of library users. The younger age group had been "exposed" to this new "medium" of information during their college days. Library users review the fiche in the Library only, since inexpensive check-out viewers are not yet available. If up to ten pages of a report are needed, unclassified pages are "give-away" and are retained by the user. If he wishes the complete report, the fiche is sent to the KSC Printing and Reproduction Facility where a hardback copy is reproduced. The KSC Reproduction facility does not have fiche to fiche capability, at present.

A continuing concern, however, is the quality of input of the various micrographic information systems. Suffice it to say that the best available copy from microfiche still leaves much to be desired.

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Although, admittedly, the microfiche are somewhat less convenient

than full-size copy for reading and study, there are several microfiche readers on the market which are quite satisfactory. (Each of the technical people in our Center has a Microcard Company device, which sells for approximately $90.) Many others around the Laboratory, as well as the Library, have readers, and we don't hear much complaint.

Of course, where sizeable holdings are involved, space considerations are quite important and the inconvenience in reading is far overshadowed by the space saving inherent in the compact microfiche library. On the other hand, graphs and tables are sometimes hard to read because the photographer has failed to note that, in the full-size copy, the graph or table is placed on the original page in a horizontal position.

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1. We receive several thousand sheets of microfiche annually at the Research Library.

2. Do our users like it? If you mean in preference to printed copy, the answer would be a 100% "no". Who does? They do prefer microfiche to microcard.

3. Most of our people review material on the reader before asking for enlarged copy.

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Our file of microfiche at present is very small, since we retain microfiche only for documents in the high energy physics field, provided we do not have the documents in full size. In the past we received a great many microfiche as standard distribution items from AEC, DDC and NASA, and these we filed by report number as a supplementary shelf list without processing. Because of cut-backs in funds and staff, we decided to discontinue the microfiche file (excepting for the category mentioned above). However, we have access to microfiche of AEC distributed material through the University of California Library, which is a depository for these.

Our users fall into three classes in regard to the acceptance of microfiche; namely: (1) complete rejection of anything but full size; (2) willingness to read a microfiche to determine whether or not the contents warrant ordering of a full size copy or having a print-out made; and (3) acceptance of a microfiche for a permanent file in the department. The first class users are in the majority. The third class is one specialized department in metallurgy.

The Metallurgy Group that maintains a microfiche file uses the Termatrex System, placing the microfiche report number on the appropriate Termatrex card, filing the microfiche by report numbers and retrieving through the Termatrex card file.

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Microfiche is indeed a regular part of our stock in trade, primarily in the R&D report collection. Each week we distribute an announcement list of reports received in microfiche form to about 650 scientists. This results in requests for about 500 duplicates of these fiche each week. Every day we have people using microfiche in our reports reading room.

I can only give you my general impressions as to how our clientele like microfiche. I feel that the reaction to it is mixed, but usually predictable. Generally, if the man is over 50, accustomed to using the literature in its traditional form throughout his career, and with his eyesight beginning to weaken, he considers microfilm an abomination. If he is a recent PhD (within the last ten years) has good eyesight, and no rigid habits as yet, he will like microfilm, in some instances even be quite enthusiastic about it. We generally try to sell our microfiche system to this latter type.

The majority of our users work with microfiche directly. There are a few who make hard copy immediately or order hard copy made for them.

When we began promoting microfiche here about five years ago, because it seemed the only acceptable answer to our continuing space problem with report literature (micrccard was not an acceptable answer) and because, again, of its obvious economy, we believed that we should

have the capability to do anything with the fiche that might be required in its use, with the object of removing as many objections to its use as possible. Thus we have personal readers available, we have fiche-to-fiche duplicating equipment, we have manual reader-printers conveniently located throughout the laboratory, we have an automatic step-and-repeat enlarger, and we have a step-and-repeat camera to make microfiche.

We are not entirely satisfied with the microfiche readers or reader-printers currently available, but we are satisfied that these are coming and that the presently available ones are adequate to make the system acceptable.

Some of our users maintain personal collections of fiche. Two of the information centers here, the Radiation Shielding Information Center, and the Isotopes Information Center maintain their basic files in microfiche form. I am not sure how these files are organized, but I don't believe they would object to telling you if you care to write to them. My own personal file of items on science information handling is kept in my desk drawer, unorganized. I don't mind pawing through it when I want one of the items.

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We presently have over 200,000 fiche, and receive approximately 1,200 each month on automatic distribution from AEC and NASA. Although the fiche allow us the convenience of maintaining a large report collection in a compact space, we have had little success in persuading our patrons to work directly with fiche. With few exceptions, they insist on hard copy being provided for their use. Their reasons seem to fall into three categories: (1) they do not want to be tied down to working only where there is a reader, even if the reader is in their own office; (2) they like to be able to easily compare pages in the same different publications, and (3) they want something they can mark and make notes on.

Consequently, when we have a choice, we usually obtain hard copy and pay whatever we have to. If we cannot obtain hard copy, we reproduce fiche with our own Microcard Corporation EL-4. Our total EL-4 usage

in fiscal year 1968 was 75,100 pages--equivalent, at a valuation of $3.00 per document, to 50% of our total number of specifically ordered documents during that period.

My own opinion is that fiche offers some convenience in the small amount of storage space required and in the decreased postal costs for distribution. However, these savings are possibly offset by the increased difficulty of cataloging and by the cost of the reading equipment required. We believe that under the present conditions, any cost savings provided by the microfiche program is an illusion--the costs are merely transferred and diffused, being hidden in the operating budgets of organizations such as ours. Indeed we are using approximately the same number of hard copies we have always used, and in addition we are providing readers, space and storage equipment for microfiche we did not previously have to contend with.

The only way to change this situation, in our opinion, is to change the work habits of scientists. In our own organization, this would require an edict by top management which prohibited the purchase of reproduction of hard copy in lieu of fiche. As long as hard copy is available, we believe that our patrons will demand it.

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In response to your letter of 22 July 1968, inquiring about our use of microfiche and its acceptance in the Laboratory we have attempted to gather the impressions of our reference and circulation librarians, have interviewed some of our heavy library users, and have consulted those in the library and the Graphic Arts department who process microfiche for use. From those efforts we have collected a rather mixed batch of complaints and compliments that seem to add up to a grudging acceptance of microfiche mixed with a feeling of resentment that they have been pushed on the market without reasonable quality control either in the fiche themselves or in the reading and reproduction equipment for them.

We have been receiving microfiche since the AEC began distributing them in 3 x 5" size in 1963. Our records show that we are currently receiving fiche for more than 30,000 titles a year and that between 75 and 85% of the unclassified technical reports that we receive are

available only in microfiche form. Needless to say under those circumstances we have had to develop procedures for handling fiche and our library patrons have been forced to use them.

Initially, the reaction of the scientists was unanimous opposition. As they became accustomed to being confronted with microfiche and began to accept the fact that much material could be had only in that form they became somewhat more tolerant, but we saw no evidence of enthusiasm until a year ago when our Graphic Arts department acquired fiche-to-fiche reproduction equipment. At that time we discontinued any circulation of microfiche from the library and began filling all requests by having Graphic Arts send duplicate fiche to the requester without charge or record. At the same time we began a drive to increase the number of readers available throughout the Laboratory. The personal ownership aspect of the new system together with the greater availability of readers seems to have had appeal and Graphic Arts reports that they are now duplicating between 2500 and 3000 microfiche per month.

Nevertheless our recent interviews with Laboratory members show that most acceptance of microfiche is reluctant. They are regarded as an unavoidable evil. As one scientist put it, "If you don't use them, you're dead", meaning that reference to microfiche is now essential if you are to keep abreast of new developments. The adverse comments advanced against them include the points that they can't be read at home or on a plane; they can't be annotated; comparison of graphical material in different parts of a document is difficult and use of indexes and references located at the end of a document awkward. To those are added complaints about the clarity of the image and the quality and convenience of the reading machines. Most of the scientists who use microfiche in the library end up reproducing some pages of the documents on our reader/printers or occasionally requesting that we obtain full-sized copies of the entire documents for them.

Besides the majority of the library users who just put up with microfiche, we have found some at each extreme of acceptance. One scientist absolutely refuses to look at a microfiche. When confronted with one he notes the author's name and calls him to discuss the contents of the report, or if that fails, has the complete report reproduced in full-size regardless of delay and expense. He maintains that librarians have

finally succeeded in their secret objective of finding a way to guarantee that all documents remain in the library.

At the other extreme there are some scientists so taken with the idea of having their own private files of documents unencumbered with library charge records that they now refuse to borrow reports from the library and insist that we procure microfiche for them instead.

Our librarians also have mixed reactions toward microfiche. On the one hand they are devoutly grateful for their spacesaving characteristics, and on the other hand they find them a nuisance to process. The problems with them that they cite fall into three categories. First there is the frequent poor quality of the image. Second the information given in the eye-legible portion of the fiche is often unsatisfactory. Frequently it is incorrect, containing inaccuracies of spelling or citation. Occasionally it pertains to a different report from that on the fiche. Often it is too incomplete to permit satisfactory cataloging. Added to those problems are the annoyances of the inconsistency of format among the producers of microfiche (despite the COSATI standards) and their use of different identification numbers for the same reports. Finally there is the problem of the way in which the microfiche are packaged. The system that we have found most satisfactory for their storage is in envelopes designed for the purpose such as the AEC uses. We have modified the AEC system by combining all fiche for a single document in one envelope and placing a slip of paper between the first and second so that the eye-legible portion is still visible. We have objected vigorously to NASA's treatment of eliminating envelopes and making the background of the eye-legible portion opaque. When those fiche are reproduced the eye-legible information is lost. We have been very pleased to learn that NASA is giving up the opaque background and hope that they will adopt envelopes to increase ease of filing the fiche. In the meantime we have obtained a supply of envelopes for fiche shipped without them.

Regarding readers and reader/printers for microfiche, we are quite discouraged. Although we have tried several different makes and models of readers in all price ranges we have not yet found one that we consider ideal. Objections include poor optical qualities, inconvenience of manipulation of the fiche, and frequently the absence of a

simple means of rotation for viewing graphical material arranged at 90° from the text.

The head of the Graphic Arts department deplores the lack of any reasonably priced, high volume blow-back equipment that would permit routine reproduction of full-sized copies. All in all the equipment manufacturers seem to have lagged disgracefully behind the market, or the government agencies have irresponsibly outstripped the technology's capabilities.

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In mid-1962 NASA set up a central facility for indexing, abstracting, and announcement services. One of their products was microfiche, and from the beginning the Langley Library received distribution of 5 copies of every report on microfiche. Four copies were available on a giveaway basis, first come first served. In the fall of 1965 we secured Kalvar reproduction equipment for fiche to fiche copies. At that time because of physical location we dropped to 2 copies of each system film (one for reference - one for a reproduction master).

Our operating rules are - respond with hard copy, if available, if not respond with (1) microfiche, (2) hard copy, reproduced from microfiche, or (3) order or borrow. However, to get hard copy reproduced from fiche requires section head approval; otherwise, some individuals would be keeping the file cabinet makers on an overtime basis. For the last 2 years we have given away about 1,000 documents on microfiche per month.

As to acceptance, a few people prefer this method, but probably most people would rather have original hard copy. Some people who do a lot of reading (or scanning) will not use it, the older people think it is a poor substitute for hard copy. There are (or were) problems (on some equipment) in looking at figures rotated 90°, people with bifocal's have a hard time even getting in a position to look at a screen. The choice is microfiche or hard copy reproductions now, original hard copy 2-4 weeks minimum, if ever, in some cases.

However it is a useful procedure. I estimate that about 1/2 the film

solves the man's problem, chiefly by letting him know quickly that the report does not answer his needs. I feel that at least 1/4 (and maybe more) of the film results in a request for hard copy. To satisfy this demand we secured an EL-4 in April 1966 which in recent months is used for approximately 400 reproduced reports per month.

The typical report is now assumed to be about 80 pages. Kalvar microfiche response (2 sheets) costs about 35-40¢ (operational costs), hard copy response will be about $2.25. Therefore, about $200 per month gets rid of about 50[illegible] requests, and those who get the approval for hard copy are still satisfied.

Problems - Early in 1966 or 1967 (not sure which) the NASA Facility secured high quality "step and repeat" filming equipment. After they solved a vibration problem our film has improved considerably in quality and, given a good original we get good copies. However, people need to improve the quality of the originals in many cases, particularly equations with subscripts and superscripts often need to be larger. We get considerable DDC film one way or another, a lot of it tends to be of very poor quality originals, and in some cases there are density and/or contrast problems that give problems in either microfiche or hard copy reproduction.

The hard copy reproduction by EL-4 is excellent when new, and reasonable in price, but it deteriorates (darkens and curls) fairly rapidly. Fortunately, management types do not want everyone keeping every document indefinitely, so while there has been some dissatisfaction here, it will not destroy the system. It boils down to this: ten years ago the user had a choice of about 10,000 items a year in original hard copy, now he has a choice of (reproduced copy) 70,000-80,000 items per year. We would not be able to get that many items in hard copy, or store them if we could, so microfiche has been and is useful. The traffic in original hard copy documents is less than half of what it was 5 years ago. And for the library staff, fiche or hard copy reproduction is cheap enough and transient enough that we give it away - no charges, no call-in notices necessary.

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Beyond the pale of AEC and NASA all is not so serene.

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The file of microfiche maintained in our library consists solely of NASA Documents. Copies of reports on microfiche have been requested from DDC on rare occasions and the fiche given to the requester for retention. The recent change in policy by the DDC with regard to pricing will probably increase the number of reports requested on microfiche.

Our customers prefer hard copy. Microfiche is reluctantly accepted when nothing else is available. We have in the library a Recordak, Model PE-1 Reader/Printer which anyone may use. Users are asked not to make copies of entire documents but to limit copying to essential pages containing abstracts, conclusions, recommendations, graphical materials, etc.

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In reply to your letter of July 22, 1968 inquiring about the use of microfiche, we can report that microfiche is seldom used in our library. Although we do have reader printers that allow us to make use of microfiche and other microforms, there is little demand for them.

Managers and engineers using our library generally dislike reading reports on microfiche. They insist on hard copy.

We find that most printers are not convenient to use because of the chemical solution required and because the quality of reproduction is usually poor.

As far as I know, none of the users in this region maintain collections of fiche.

We have found general resistance to the use of any type of reports other than hard copy. In addition to the frequent complaints of poor legibility of microfiche, it is objected to on the grounds that it can not be taken on field trips or loaned to colleagues in the field who do not have readers. We do not yet have portable readers in the Region.

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There is absolutely no acceptance of any microform whatsoever by patrons of our three technical libraries. We use microforms as little as possible, and then only to save space, to save money, and when hard copy is not available. Our patrons refuse to use machines and ask us to print out anything they are interested in. Any personal collections are of hard copy.

Of course, most of our work is done by telephone and interoffice mail, and it would be very expensive to provide machines in dozens of offices. In libraries where patrons come in extensively to do research, acceptance might be better but I doubt that it would ever be enthusiastic. Microfiche is a convenient form for publishers, and is easy to reproduce and mail. Other advantages claimed for it do not impress me. From the users standpoint I think it is almost always better to have hard copy.

We do make extensive use of cartridged microfilm in our automatic retrieval equipment (Miracode) in each of our libraries. Here the film is an integral part of the system iteself and the self-contained cartridges are a great labor-saving device. When similar labor-saving devices and information systems are devised for microfiche, it may become more attractive. As you know, some interesting work is being done along these lines.

In summary, I must say that we regard microfiche as a print substitute, a barely necessary evil, and an annoying problem.

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CHAPTER VI

INDUSTRIAL LIBRARIES AND MICROFICHE

The largest single body of libraries with microfiche experience found in this survey was those with industry. Forty had microfiche experience and liked it (with some reservations); twenty disliked it and/or hadn't seen their way to getting any.

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Microfiche has been an integral part of the XXX Technical Information Processing System (TIPS) since 1 January 1968 when the Science Center became the last unit to have microfiched all unclassified and non-copyrighted material entered in TIPS. The master microfiche for each document is maintained in a central Microfiche Center from which all other divisions of XXX can then obtain a copy. In addition, all the NASA microfiche received by XXX are also a part of the Microfiche Center collection and thus accessible to all divisions.

But to get on to your questions. We wouldn't say that our users like microfiche but they are learning to live with it. We have several Bell and Howell Mascot readers that we check out to the users. Some of the heavy microfiche users have readers permanently assigned to them.

Since January 1st we have not made any complete full size copies from microfiche, although a few pages in a few documents have been made on a reader printer. If full size has been needed so far, a copy has been reordered from the source (NASA, DDC or Clearinghouse). Of 155 documents supplied on microfiche for the first five months only 5 were reordered in full size. We have an agreement with one scientist (a heavy technical report user) that if a lengthy document (on microfiche) has charts, appendices, etc., in the back of the report which he must refer to constantly, he will ask us to get a full size copy for him. In two months this happened three times.

Retention copies of microfiche are given out, thus eliminating circulation records. Although we do not have an inhouse fiche reproducer, we can get 24 hour delivery from the corporate center and we also have special arrangements for quick service with another local XXX division to whom we gave our Atlantic Microfiche reproducer. For each document we submit to TIPS we receive from the Microfiche Center three microfiches. When we get down to one copy, we reorder.

As soon as a user begins to receive microfiche and develops a file, he is given a black metal (4 3/4x6 1/2x6) filing box for his collection. In regard to your question on how they maintain their personal collections of fiche, the answer is "badly." So far, no one has collected a large enough file to organize it. I suppose it depends on the individual, but seriously he will probably arrange it as he does his reprint file - either randomly or by his own unique subject terms. One scientist is filing his fiche by the accession number on the microfiche (N, AD, A, etc.) and is keeping a card for each subject on which he enters the fiche number.

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We have been operating with microfiche for two years, primarily because of the availability of U. S. Government reports on fiche and consequent reduction in file size, ease of reproduction and multiple distribution of reports. Much of our technical project material has similarly been reduced to fiche and copies (diazo) provided upon request, with charge-out and recall only for classified material.

The random accessability of fiche is a very desirable feature for technical reports. Closed files, unfrequently interrogated, may be more suitable for cartridge, with powered (motor driven) readers or reader-printers. The two systems are quite compatible and we are in the process of reducing a large volume of material to cartridge because of the economy relative to fiche. (This is a semi-closed file.)

Large collections can be fiched through outside services; an in-house rotary camera can be used for daily filming of small collections and up-dating made possible with jackets or adhesive-backed cards.

Legibility is good, even on the diazo duplicates. Problems arise with low contrast subscripts, superscripts and other relatively small characters, but very little difficulty has been experienced thus far. Long term reading of any micro-record is tedious, but most of the usage involves scanning of several papers and thorough reading of only one or two at a time, so this has not been a problem. Convenience of storage and the ease of generating multiple copies for personal files has more than offset the inconvenience of a micro-image.

Retrieval of all information is enhanced through use of a computerized KWIC index system, with descriptors added as needed to insure adequate cross-references when the bibliographic information is insufficient. While the arrangement is not as formal as more elaborate systems, information content is the same at minimal cost.

The system operates in a group of about 50 engineers and scientists, providing information from a central report collection. Part of the collection has been generated from personal files and personal fiche copies will be returned in lieu of the hard copy, if requested. This part of the system has not been in operation long enough to define preference for personal collections.

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Microfiche is now a regular part of our stock in trade in that we receive thousands of microfiches from NASA, and when our library users do not specify hard-copy, we order microfiche of AD documents automatically. However, we intend to avoid classified microfiches, so it is our policy to order all classified items in the form of hard-copy. We also order hard-copy of limited documents.

It is too early to give a reliable conclusion as to whether our clientele likes this procedure. The fact that we have not yet obtained additional microfiche readers to place in locations throughout the department causes some inconvenience and dissatisfaction, but we feel this will diminish later when we acquire the needed readers. So far we have been somewhat surprised at the small number of objections raised.

Some of our users accept the microfiches and use them on the reader without asking for hard-copy while others make hard-copy after examining the microfiches. There has always been one or two persons who have nothing at all to do with micro material in any form.

So far as reproducing facilities are concerned, we have two reader-printers in the library and these are used for producing hard-copy. We obtain a work order number, the user makes his own copy for retention, and the cost of the paper comes out of his section's budget rather than out of the library budget.

We have been receiving AEC unclassified microfiche, NASA microfiche in all classifications, and DDC microfiche in all classifications for about the last five years. Needless to say, we have thousands of reports on microfiche.

To answer your letter directly, our customers: (1) accept microfiche "fairly well" if it is an only source; they are happier if they can take the fiche and portable reader to their office than they are if they have to read it in the Library; (2) the best readers we have in terms of ease of reading are the Bell & Howell portables; (3) we make no attempt to automatically restore microfiche to hard copy. We do not employ any outside firm to make this restoration; (4) none of our customers - yet - maintains personal microfiche files, but Lord knows what will happen once the DDC program gets rolling.

There doesn't seem to be any outspoken objection to the new DDC program. We do have customers who flatly refuse to read fiche and insist on hard copy, but these are in the minority.

My personal convictions are that people will resist the microfiche! The ones who feel most strongly will buy a reader of their own - depending on cost. There will be lots of problems with the highly classified fiche because people who must work with classified reports will not want the inconvenience of microfiche and the accountability and reproduction will cause peculiar problems.

I head up the Space Systems Division Branch Library within the XXX Co. library system. We serve about 2500 engineers whose primary interests lie in the space sciences, hence the NASA reports are of the most interest. We keep all NASA N's and X's in microfiche form for a four year period.

The Main Library in Culver City keeps a file of selected DDC reports on microfiche and they have Kalvar reproduction facilities there.

In the Space Systems Division Library we have a 3M reader printer and the patrons are allowed to print up to 10 pages at any one time. If they need a hard copy, and their supervisor will okay it, we send it out to a vendor to be reproduced at ten cents a page.

Since DDC started charging for hard copies, and being very cost conscious ourselves, most patrons have not raised any objections to using microfiche. We make portable readers readily available on long and short term loans. In fact, after using them for a while, the men usually find that microfiche is very effective for purposes of scanning the literature in a particular subject. Very often they will only need to reproduce a graph or table or the bibliography or table of contents. As far as I know no one in this division is currently keeping his own file of microfiche reports.

One of the main reasons for wanting hard copies is for purposes of display at a group meeting of engineers. The reports are also frequently split up and sections given to different people to study.

Since time is a crucial factor in many instances our engineers are grateful for any form of a report which is available NOW! Therefore, forced by economic and time factors to use reports in microfiche form, most XXX engineers have adapted to the way it is!

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Microfiche have been a regular part of our stock in trade since early in 1963. We now have nearly 300,000 NASA and DDC microfiche.

Our clientele use fiche gladly when that is the form in which we have a report. Given a free choice, most prefer the hard copy, yet some are very pleased when we can produce a fiche from stock and give them "immediate information." Microfiche make it more economical to have the information on hand for the engineer or scientist, than to have to order it and wait for it after he has expressed his need.

A number of our users work directly with the microfiche, scanning reports first in this form. As needs dictate, they either take notes on what they want, print out selectively from the fiche, or request that we obtain a hard copy for them. Urgency of need and/or cost determines whether an entire fiche will be copied on our equipment.

We have three reader-printers in this Department and seven others are available elsewhere in the Division. For simple viewing of microfiche the above pieces of equipment serve well, as do some eight other plain reader units. This last category is likely to increase considerably in the next few months.

Our readers and reader-printers seem to be satisfactory to most of our users. We can produce one-second prints on our reader-printers (3M model 100's) from most fiche. Our users like this feature and it virtually eliminates complaints about time required for the making of prints. Naturally, we look forward to improved and less costly readers and reader-printers. We are hopeful that a good $50.00 reader will become available soon and that the cost of printouts will come down.

At XXX Aircraft Company, Culver City, microfiche has become part of our way of life. Before DDC started their campaign to replace full sized copy with microfiche, XXX was already moving in the direction of microfiche. We had begun a program, which is now in limbo due to lack of funds, to convert all XXX reports from hard copy to microfiche. In conjunction with this program, we have bought over fifty readers which have been loaned out on a permanent basis.

Before the experiment with DDC on the use of GAB which XXX is participating in, XXX was aggressively acquiring all the microfiche it could from DDC. XXX had filled out separate Form 1's for the fiche available from DDC. NASA has sent us two sets of their fiche, one for a branch collection. Due to a reduction in force, we have cancelled the branch set. With XXX being in the GAB experiment, DDC fiche are being sent to us automatically in the categories where we have established fields-of-interest.

XXX is participating in both NASA SCAN and DDC GAB which are backed up with microfiche. We find that a majority of the people who request reports from these two announcement publications have been asking for their reports in fiche form. I would say that we have had a favorable response to the use of SCAN and GAB backed up with fiche reports. Since we loan out microfiche readers on an extended loan basis, many of our users have accepted the fiche system with little resistance.

In one case where I sold one of our scientists on SCAN and GAB with a microfiche reader, I found that he is more than satisfied with the system. In a quick survey of this one user, he says that he is uninhibited in his use of fiche in order to find the items he wants in hard copy. He reorders those things which are really pertinent in hard copy. His use of SCAN and GAB are such that he considers them as giving him excellent coverage of the literature in his field which

happens to be lasers. He is keeping a personal collection of his fiche. Since his fiche collection is small, he has kept them in a small pile close to his reader. He doesn't throw away any of his fiche which is an indication of their value to him. There are four other men who also use this reader and the microfiche. The man I surveyed said that these four do not use the system nearly as much as he does, but that they do use the system and feel it has value. This user gave the SCAN, GAB, fiche and reader system "an unqualified endorsement." When I tried to find out if the information he got from the microfiche we were sending him helped solve his technical problems, he said that the system has been very useful.

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We maintain an information retrieval system for internal documents which now contains about 35,000 documents. These are microfilmed and slipped into 4" x 6" jackets. After verifying, the hard copy is destroyed except for our Technical Research Reports. Two hard copies of these are kept for five years and the "approved" copy kept indefinitely for legal purposes in our Technical Library.

The main reason for microfilming, of course, is to save space. We have also found that retrieval of the desired documents is faster since they are all located in only two file drawers at present, adjacent to a reader-printer.

We still find some resistance to the use of microforms by our professionals, but this is slowly being overcome by an evolution rather than a revolution. We also use the IFI/Plenum service for U.S. Chemical Patents, which is searched almost daily by our own group and other professionals.

When the AEC changed to microfiche from microcards in 1963/64, we had considerable difficulty in educating our scientists and engineers to its use. They had become very unhappy with the quality of microcards and the inability to make full-size reproduction. Once they gave microfiche a try, these barriers were quickly broken.

A few die-hards still requested hard-copy as a matter of routine. Therefore, our first established policy was that the individual had

to view and evaluate the microfiche before a full-size copy would be reproduced or ordered. This significantly reduced the number of orders. However, no personal microfiche files have yet been established, nor any anticipated in the foreseeable future.

Although an exact count is not available, we guesstimate there are approximately 150,000 unclassified reports in our holdings in one form or another. Information concerning our full-size materials was placed on 3x5 cards and interfiled with the microcards. Now that the government agencies have standardized on the 4x6 format, we must maintain two files and remember to check both of them when searching for a specific report. The alternative would be to transfer all records into 4x6 files; but the cost cannot be justified on convenience.

The current trend in the attitude of the scientist appears to be toward the concern that the information be available, regardless of format. Of course, convenient reproduction facilities increase user satisfaction.

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We have a large quantity of microfiche, mostly DDC and NASA. To date, we have not made adequate use of it because of the lack of a duplicator and sufficient readers. The microfiche have generally been used only when hard copy was not immediately available. However, we have now on order a duplicator and processor, another reader-printer, and many readers. We expect to be fully operational by year-end. Requests will then be met by supplying microfiche (or hard copy while it lasts). Our hard-copy collection will gradually become a browsing, reference-type collection with an ever-decreasing number of charge-outs. There is some resistance to the use of microfiche but we believe that as service improves the users will take note of the several advantages.

The quality of microfiche equipment has improved greatly, but not all good features are incorporated in one make. We therefore anticipate further improvements. The capability of handling equally well microfiche, aperture cards, and roll film in one equipment at low price is ideal but perhaps not readily attainable.

Some users, especially technical information people, are beginning to maintain microfiche in their desk drawer. I am convinced that many specialized personal collections of the desk-drawer type will be initiated when we are able to supply fiche to the users by SDI or in response to requests for documents or for searches.

For the past few years we have been receiving large quantities of microfiche from NASA on automatic distribution, and have gradually built up a file of these so that we now have approximately 90,000 of them. These have been used primarily as backup to our collection of full size reports. When someone requested a report which we did not have in full size and which the requestor was in a hurry to see, we would check this file of microfiche (arranged by NASA accession number) and if we found a microfiche of that report, the requestor was notified. He could then read it on our microfiche reader immediately. If he then wanted a full size copy, we would order it from NASA.

It used to be our policy to provide full size copies of reports available from DDC for the retention of persons who requested them. Now that DDC is no longer providing full size copies to contractors free of charge, we will no longer do this and have notified our Library users of the new policy. We will continue to supply microfiche as long as they are still available free of charge from DDC. If the user insists on full size copy, he must order this through the Purchasing Department and the Library does not become involved.

It is a little early to judge user acceptance of microfiche. As the situation stands now, it seems they will have little choice in the matter.

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1. Is Microfiche a regular part of our stock in trade?

Yes, we currently have approximately 100,000 microfiche on file. In addition, each new accession to the Library is immediately filmed and a master fiche maintained on file along with copies.

2. How does our clientele like it?

User acceptance is varied. Generally the patron's first confrontation with a fiche rather than hard copy results in shock, and in some instances, downright refusal to use the fiche. Generally speaking, however, after using the microfiche for a while, most users accept it, especially when they realize that we can get the information to them faster and that they may keep it permanently when they get the fiche.

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Let me say first that as a heavy DDC and NASA user, we do prefer the hard copy to microfiche (this is both for personal preference and also from our user reaction as well).

With the advent of DDC charging for hard copy, our number of requests for hard copy has had about an 80% transfer to requests for microfiche instead. We have previously had the Filmac 400 Reader/Printer in the library for users, but hard copy has been traditionally preferred by our clientele.

A half dozen portable (Bell & Howell MASCOT) readers are in the process of being distributed throughout our Research and Engineering departments with more of the same readers expected to be requested in the future based on demand.

We limit the quantity of prints to 5 pages of each report but not reproduction of the entire document. If more prints are required, the hard copy is requested.

On the positive side, I would say that users are being more selective in their choice of hard copies ordered since their departments must bear the cost. Microfiche is ordered free and the user is not obligated to return them to the library unless classified or otherwise prohibited.

The readers mentioned are of high-quality; some of the fiche received could use improvement - such as double or blurred images - and how do you annotate a fiche?

The library does maintain its own collection of fiche by source and report number (with cross reference to DDC, NASA or other accession number).

Hope this meets your questions in: (1) yes, fiche is now part of our regular stock-in-trade; (2) no, we don't prefer it to hard copy but; (3) it is better to see a document free than order hard copy.

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Re microfiche--it is, indeed a regular and increasing part of XXX stock in trade. As a major government contractor, DDC and NASA are our prime information sources, and since we have been storing our collected reports on 16mm film cartridges for the last seven years, anyway, we have made a nice cost reduction by requesting free microfiche, thus eliminating the necessity for our filming those gosh-awful hard copies furnished.

So far as acceptance of fiche by our users is concerned, general consensus seems to be that if film must be used, fiche are better than roll film. (What is the plural- fiche or fiches?). Of course, given a choice, nothing beats hard copy for close use. The younger ones accept fiche better than their elders, and engineers, looking primarily for data or specifics, more readily accept film than the scientists who wish to digest and cogitate. When you market your cuddly cheapy--with two-position display, please, for comparison purposes--we may win the latter over.

At my suggestion, our people are mass-ordering microfiche for evaluation and selection (a necessity forced on us by the closing of DDC field offices---that was a blow!) and then ordering hard copies of the reports they consider really useful.. We keep the fiche and they can do with the HC what they will. Under 20 pages, we make copy here, over that it's cheaper to pay the government.

Incidentally, our Security Department naturally prefers fiche; thinks it permits closer control.

Our library serves a fairly small group of personnel (approximately 1200) engaged primarily in the research and production of the NERVA reactors (AEC-NASA). As a result, we received sizeable weekly distributions of NASA and AEC reports in both hard copy and microfiche.

We were quickly running out of storage space for hard copy, and, due to staff reduction, out of time to process requests for items abstracted in STAR, NSA, TAB, etc. With the announcement by DDC that only their microfiche would be available free of charge, along with CFSTI's provision of microfiche at minimal cost, we decided some action was called for, and approximately eight months ago we initiated an extensive campaign to condition our users to microfiche reports.

We purchased ten desk-sized readers for distribution to key locations within the laboratory (these in addition to two reader-printers and one reader in the library). We filled requests for documents with microfiche copies at our expense unless hard copy was specifically requested at the user's expense. We circulated our collection of microfiche for a period of approximately five months until the Atlantic microfiche copier (diazo process) that we ordered arrived. We now provide copies of microfiche for permanent retention. We are also in the process of converting our internally-generated reports to "microfilm-in-jackets" microfiche.

Our solicitation for comments to your letter to DDC evoked only one response - a survey taken within one department (designed by the department, not the library). This department is a heavy user and requestor of reports; it is physically the farthest group from the library. It had been given two readers at the time of their distribution, but at the time of our solicitation for comments it was still somewhat disgruntled by the microfiche format.

The survey replies (13) seemed rather in agreement on two items:

a. Do you prefer receiving microfiche rather than full-size copies of reports from the library?

1 - yes 12 - no

b. Would you prefer microfiche in maintaining your collection?

13 - no

Users seemed to agree that legibility was fair, availability very good, quality of readers fair, and quality of cards fair to good. As for convenience, most replied that the 'fiche were easy to store and useful for scanning, but that whenever frequent cross reference to figures or bibliographies was necessary they became cumbersome.

Library policy now is to provide microfiche at first, but to secure hard copy later at the user's expense whenever the user finds it is necessary. At this date we are finding more and more acceptance of the microfiche.

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One of our scientific types expressed pleasure recently when told the document he wanted would have to be on 'fiche. His reasons stem from convenience. He said having 'fiche and a reader (we use a Bell & Howell portable) eases the security problem. If someone comes into his office he doesn't need to lock up the reports, unlock the reports when the visitor is gone and otherwise go through "procedures". Instead he simply secures the 'fiche by placing it in his pocket.

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The pros and cons: first, the engineers don't like microfiche. They are difficult to read, and since the average engineer does not like to read anyway, it serves as another excuse. The creative engineer will accept microfiche as another hazard to put up with. In terms of convenience, microfiche are ideal. We have a data base of over 200,000 documents which can be maintained indefinitely: for quick and dirty first explorations we can provide information without sweat. When they're pushed into it they will accept microfiche format. They prefer hard copies.

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I have observed the use of microfiche at 3 special libraries during the

past 7 1/2 years. My experience indicates that we cannot expect a 100% acceptance of microfiche. Many engineers and technical employees are willing to scan reports on microfiche and then order full size copies of selected reports, or portions of selected reports. Other people seem to have a mental block against using microfiche and prefer to use full sized hard copy--even if it is old and obsolete!

The greatest problem area is the executive branch of most companies. The reluctance to use microfiche increases directly with the employee's level on the company organization chart. Many executives prefer to operate from their offices and would rather not go to the library or information center to use a microfiche reader. Some prefer to not read at all if they must use such readers.

The greatest level of acceptance of microfiche is with young employees who have not developed too many preconceived notions about format. Some of the older employees who are unusually progressive seem to have no qualms against its use, but they are in the minority. If microfiche has become a way of life with a company, then new employees--regardless of age are receptive to its use.

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The researchers here seem to have always a chocolate bar (ex wrapper) in their hand when they pick up a microfiche. They invariably clutch it to apply the greatest quantity to the most important frame.

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And yet, the vote is not unanimous.

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During my 10 years here, the incidence of microfiche has only slightly increased - in spite of the National Lending Library, Boston Spa, Yorkshire, receiving the AD and PB series as fiche, and issuing as fiche, too. There's a built-in resistance with scientists - who maintain they need to 'browse' in their literature, so fiche is in disfavour.

Blow-up versions can be made, - once the fiche has been looked at and found relevant - either by purchase of full-size copy from NLL, or using our 'tame' photographer (and ruffling his temper in the process!). The scientist's reading is somewhat primitive in the Labs - a microscope, a hand lens or some other devious device.

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When given the option of ordering full size or microfiche copies, price seems to make little difference to our users who always prefer the full size copy. If, however, a microfiche copy was already on hand in TIC* versus a full size copy which would have to be ordered, I am sure that some users would be satisfied to view the microfiche in TIC at least to determine if they really needed a full size copy for more extensive study. The capabilities of presently available reader-printers are not fast enough to make in-house reproduction of full size copies from microfiche practical for more than just a few pages at a time. (A new Xerox microfilm attachment for their copy machines may improve this situation.) Providing copies for users in remote locations would thus require continuation of a fairly significant amount of full size copy ordering, which could possibly be reduced to some degree by providing extra readers in various remote locations and an in-house capability for reproducing additional microfiche sheets from a master copy.

Increased usage of microfiche by XXX would thus depend on the following factors:

1. Establishment of an in-house microfiche collection from which document requests could be filled without waiting to order from outside sources.

2. Better full-size copying equipment such as perhaps the new Xerox microfiche copying attachment.

3. Distribution of additional readers to various convenient remote locations.

4. A rapid in-house capability for reproducing microfiche itself.

Microfiche collection of reports are fine for the government agencies and the companies with large engineering groups. The people who suffer are the technical men in small companies or small installations.

If one is to maintain a microfiche collection, one must be able to copy reports. This means one must pay $1200 - $1500 for a reader-printer. The cost is prohibitive for a small company or small installation. A great deal of material, such as Thomas Register and government specs. and standards, is available in microfiche form. Some installations do not use this type of information enough to warrant purchasing the equipment. Currently we are using the microfilm reader-printer to copy microfiche, which is far from satisfactory.

We find that our technical men resist using microfilm and microfiche. If we obtain a microfiche, they invariably want a hard copy. We usually just order hard copies from the first. Currently they are not interested in building up their own files.

Our men are engaged in developmental work. We do not have large groups of engineers working on one project and demanding access to the same reports. A particular report might be of interest to 10 or 12 men, but only 2-3 would want retention copies.

We, too, have terrific space problems; we cannot build up vast files of reports. However, we are brave enough to weed because we can always obtain copies from DDC or NASA. Our experience is that we can assign a 2 year retention to 90% of the reports that we order. Perhaps you would want to consider in your report the "half-life" of a report vs microfiche.

The avowed goal of various government agencies is to facilitate dissemination of technical data. The emphasis on microfiche only defeats the goal due to: (1) expense of copying equipment and personnel to maintain the service, (2) reluctance of scientific and technical personnel to use microfiche, (3) psychological barrier between librarian and client to hand a man a report than he cannot read without special equipment, (4) tends to preserve "ad infinitum" reports that have only current usefulness.

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Classically we all have a problem getting the latent readers into the library to read even hard copy. Fiche could take a big bundle right to these people if only they had a really convenient way at hand to read it. As to the overall fiche set up the way it is now, it doesn't move the information to our men because:

we have only one reader
there is tremendous fiche reader resistance
we're ordering fewer reports and thereby cutting our serendipity factor

I believe that fiche as a format is a breeze to handle and use - given a "cuddly fiche reader" for at least every three or so customers. Without the fiche readers it's a pain. Out of 2500 employees we have two occasional readers: me and an applied research chemist. He's reading with a hand reader because it's portable and he's complaining about his eyes.

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We have been on NASA's fiche distribution and tape search program from its beginning. This current year we have been on DDC's ASP program for distribution of fiche in 100 COSATI categories.

Our people are beginning to appreciate some of the advantages of fiche and do not universally dislike it. We plan in the near future to have readers strategically located in group working areas and also to have a fiche duplicator in the library. Then, we can quickly and cheaply give the user a copy of the fiche to use and retain in his own personal file. We believe our people will use fiche, we are getting more converts daily and at the present time have reader reproducers in the libraries only.

Our readers read the fiche, often reproduce only a few pages of the report and are satisfied, others note the report is not what they wanted and do not request a hard copy, and others will want hard copies ordered or reproduced.

We plan to discourage ordering hard copies whenever possible, and at present have only 3M model 400 reader printers to make hard copies. We are moderately happy with present quality of the fiche and the readers, and notice it is still hard to read for long periods of time with the best of equipment now available.

In conclusion let me say this. I believe the average engineer or scientist will use a fiche 80% of the time, if it is on hand, and he would have a delay in getting a hard copy.

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We have documents from DDC, NASA and AEC on microfiche.

The fiche is sent to persons registered for surveillance of the literature when it first arrives with the enclosed notice attached to it.

Reaction to this has been varied but I think a fair estimate is 10% are actively annoyed by this form, 10% pay no attention and return it without looking at it, 10% order hard copies, 10% come in to the library and read it on the reader directly without making hard copies and the rest glance at the titles and return the fiche to us for filing. This sample is less than 100 people. In addition to the fiche the library has had some experience with military specifications and standards and vendor literature on cassettes. A completely different group of people use these and there has been very little complaint from those coming to the library for this purpose. How many more people would use this material if it were in full form I don't know.

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Microfiche does solve the library storage problem. We order most of our DDC, NASA, etc. reports on microfiche now. We are contemplating transferring most of our other reports collection to microfiche or microfilm.

The engineer is being forced to accept microfiche. He prefers the printed copy. Even though we have portable readers, it does not satisfy him. Engineers or scientists located in other or distant locations or buildings feel that a microfiche copy is not convenient for them to see.

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First, some background: We are a medium-sized library/information center located in a new building specifically designed to serve the information needs of a select group of 89 PhD's engaged in basic research.

We maintain optimum conditions for the use of film and fiche reader-printers; yet we have only two regular users of microfiche. Scientists use our microfilmed patent collection and A & I services with aplomb and studiously avoid the fiche for their personal files.

Why? I am convinced that it is a matter of scientific working habits and film quality. Unfortunately, not all microfiche conform to the COSATI standard; and as you know, most scientists prefer handling hard copy.

For several years we have tried to promote the idea that a microfiche copy of an AD or PB is easier to handle, more economical and convenient than space-wasting hard copies. I envisioned acquiring a stock of portable fiche readers which a user could keep at his desk with his personal file of microfiche. The fiche could be filed conventionally or handled as notched cards such as McBee keysort. The response to this program has been less than enthusiastic.

Both of our regular users were initially forced to use microfiche for their personal files because a large percentage of their data was not available in any other form. I suspect that these introductory circumstances are not unusual.

Both users belong to one of the newer disciplines: Computer Science and Health Physics. A film and fiche reader-printer once used by the

library is permanently installed in the Computer Scientist's office. His collection of fiche is an assortment of 4 x 6, 5 x 8 and 7 1/8 x 3 1/4 sizes. I admire his patience, because only one size is easily handled in his machine. He wants to retain the printing capability and therefore is not interested in one of the portable readers. This is our scientists' fundamental reason for limiting their use of microfiche.

Our Health Physicist would rather leave the filing and retrieval of his microfiche to the library staff. He makes selected prints from each report and files these. He prefers to visit the library instead of viewing the fiche at his desk.

Although complete acceptance of microfiche will be slow, I expect that its use for personal files will increase as information people insist on standard fiche and low cost read, step and print machines. Financial, as well as space considerations will keep the printing function in the information center. The fact that hard copies are not vital to research success will become apparent as more scientists repeat the experience of our two regular users.

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We see by the foregoing that the microfiche-based information distribution system is rated satisfactory or better by almost all of the participants, in its operational-purely mechanical aspects. In addition, there were specific and repeated statements that the microfiche system was an improvement because of the lower "frustration factor". The material announced was generally available and there was appreciation of the compactness of storage afforded by the microfiche format. However, the use of microfiche as a working document is not nearly so favorably considered. Utility of the microfiche as a scanning document, a quick and cheap means of determining actual pertinence of information content is generally acknowledged; but the tendency is to consider that once such pertinence is established, hard copy should be available to work with. The hard copy availability problem, either in connection with the signature-for-purchase requirement (6 times) or in connection with reader/printer shortcomings, was mentioned on 18 separate occasions during the interviews.

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XXX's Technical Data Center is small yet well organized to meet the needs of approximately 60 engineers, technicians, etc. We welcome microfiche as a convenient means of handling a large volume of reports which otherwise would require more space than is available.

Our technical personnel have not been as enthusiastic about microfiche as our technical librarian. At present we have only one reader and no reader-printer. This means that the requestor cannot take the report to his desk and he usually considers this an inconvenience. We hope to solve this soon by purchasing a few low-priced readers which have just recently appeared on the market.

A report often includes a graph or other item which the requestor needs in hard copy. However, this happens too infrequently to justify a high-priced reader-printer. Our only solution is to send the microfiche to an outside service company for reproduction. This is costly and causes delays.

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The subject of your letter is one which has been occupying a good part of our attention during recent months. We have been concerned with the matter of fiche versus hard-copy for some time but the recent decision by DDC to charge a $3.00 service charge for hard-copy reports has caused us to appraise our position rather carefully.

We are currently going ahead with a policy of acquiring and supplying only hard copies of technical reports to our users. We are obtaining only one copy of each report but, since we often have multiple requests for the same report, extra copies are being manufactured using a Xerox 2400. About 70,000 requests are being handled annually in this way.

We are following the hard copy route because we feel that microfiche would be unacceptable to most of our users. Many employees like to

do their reading at home in the evenings and this is incompatible with microfiche unless they also carry readers home with them. If we did supply fiche copies we feel confident that in many cases hard copies would also be required with all of the resulting cost and complications.

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While we welcome the low cost and space saving capabilities of microfiche, our users still greatly prefer full-sized hard copy. As a result, our current practice is to order both hard copy and microfiche for government reports that are requested by our users. We give them the hard copy and file the microfiche for future use. This permits the user to have the convenience of a report which he can read easily in his laboratory or at home and keep as long as he wishes. Should anyone else request the report, or should he need it at a later date, we can pull the microfiche from our files. Our users are so scattered and reluctant to use microfiche exclusively, that it just isn't practical to obtain readers and/or reader printers throughout our laboratories.

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We do have some material on microfiche. The few people using it seem to like it. They work directly with the microfiche and only if they need a copy do they then make a hard copy. We are using 3-M reader-printers for reading microfiche. These machines convert for using either film or fiche. The quality and legibility of the fiche nd the printed copy is acceptable. None of our users maintain personal collections of fiche.

I would like to add that the use of microfiche at the moment is satisfactory only because we have very little material on it and only five to ten people using it regularly. I do not intend to purchase any further material on fiche because of the inherent problems of maintaining the file in proper order.

CHAPTER VII

UNIVERSITY AND NON-PROFIT LIBRARIES AND MICROFICHE

None of the libraries in this class regarded microfiche as an unmixed blessing: 7 were in favor of fiche, with many reservations; 11 were completely opposed to fiche, even to the ultimate in opposition, not using it at all.

Some use microfiche even though they don't like it.

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Like other NASA contractors, we have been receiving continually increasing numbers of reports in microfiche even though we do specify that we want hard copy. Also, the new DDC ruling affects us mightily because we are a small engineering group working on a limited budget. Paying for hard copy could become prohibitive.

We have explored many microfiche and microfilm readers and reader-printers. We have also weighed the possibility of purchasing a reducing camera versus contracting a local company to microfilm our own documents and engineering drawings.

Since our budget is limited, we have decided to eliminate the reader-printer. Not only are they priced at $1200--up, but printouts would have to be limited to selected pages and graphs because, for example, the 3M 400 reader-printer costs 8 cents a copy just for the processing. Consequently, we need a reader that is portable so that our engineers can read lengthy reports at home, and it must be easy on the eyes. The light source in the less expensive, and consequently lighter weight readers-e.g. the Bell & Howell, and the Eastman Kodak produces a central glare spot on the screen which makes reading for a longer time difficult.

Equally frustrating is the discovery that most companies recommend separate machines for reading microfilm or microfiche or aperture cards.

So where are we--Reader and reader-printers are really not perfected

or priced right, but government policy and indeed, the paper explosion, dictate that we must utilize this new medium. Any good ideas?

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We are probably not the usual user referred to in your letter as we produce microfiche and therefore use them continually. You are possibly familiar with INTERNATIONAL AEROSPACE ABSTRACTS which appears semi-monthly; about 50% of each issue being available in microfiche form. Apart from our Photolab and production services for other users, we do, of course, maintain a complete file of these fiche in our library section which is continually referred to by our members and other members of the public, we have in our Reading Room a reader for this purpose. We also maintain a complete set of NASA STAR microfiche which gets similar usage. We find it a saving in space and constantly try to indoctrinate those of our users who would prefer a printed book. We do have on the premises an EL-4 with which we produce hard copies for requesters but this service is primarily for requests by letter, telephone, TWX, etc. Most users are satisfied with reading it, though we can give them hard copy if requested. It is doubtful whether anybody is completely satisfied with current microfiche readers and printers but we do find the EL-4 faster, the copy easier to read, excellent for halftones and comparably priced with similar reader-printers for which our quantity demand is not suitable.

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The XXX Library receives microfiche from DDC, NASA, and AIAA. The Library, at the present time, has just one reader-printer and a few portable readers available to users of 'fiche. As a member of the Reference Group I have found the fiche useful only in the quick access it gives us to handle "rush" requests for documents from our scientist-engineer users. Our procedure is to furnish the fiche copy to the user who then has a full-size copy printed at the Laboratory's reproduction facilities. We have found that our users prefer full-size

copies and appear unconcerned with all the "hoop-la" put out by various organizations over the advantages of microforms.

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1. Is microfiche a regular part of your stock in trade?

   Yes - of some 1800 reports received in our Technical Files each month, about two-thirds are in microfiche form.

2. How does your clientele like it:

   Acceptance of microfiche is increasing. We have yet to find a customer who prefers it to full-size hard copy; however, the complaints to our Files management have definitely decreased since the initial introduction of microfiche.

3. Is microfiche used directly by the clientele?

   Yes. The method of circulating reports that are received in Files in microfiche form is to reproduce a duplicate microfiche and send it to the requester for his retention. Microfiche readers are available to all plant personnel on the same basis as office equipment. About 50 readers are thus placed around the plant.

4. Facilities for reproducing duplicate fiche?

   Technical Files has an Ozalid fiche reproducer for our fiche circulation program.

5. Quality of current microfiche readers and reader-printers?

   The major objection to readers we have on plant is from wearers of bifocal glasses. They dislike the vertical orientation of the viewing screens. This is most often objectionable when the reader is also recording data points from graphs or other information onto paper lying flat on the table. At this time, readers in the field are primarily FR-5's and Atlantic-66's. I notice some more expensive

models do have more sloping screens, or even project the image right onto the desk surface.

Our major objection to printers is the cost per page for copying.

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We elected about two and one half years ago to receive AEC unclassified reports in microfiche format for the following reasons:

1. We were running out of storage space (this makes us unique, of course).

2. The body of users at XXX interested in these reports is very small (not exceeding 50 people out of a total user population of approximately 600) and consequently, protestations over using microfiche would not drown out all the other noises users habitually make.

I started with this token program deliberately, precisely because I wanted to see what sort of reaction I could expect when -- inevitably -- we expand our microform holdings. We now have 6 portable microfiche readers (all of them by different manufacturers because I've yet to find one I feel justified in ordering in quantity) and about 4 of them are out all the time (usually to the same individual -- I can't claim any universality of acceptance).

What I am attempting now is to insist that the individual at least scan the fiche before he orders a hard copy. At present we do not have in-house capability for blowback, and sending fiche to outside vendors for reproduction in hard copy costs us 10¢ a page. Eventually, as demand increases, I foresee such an in-house capability -- but not in the library, thanks all the same. Users of AEC material have been very cooperative about scanning before ordering; others have been considerably less so.

As far as I know, no one in the organization has personal files of microfiche. I would like to encourage this, but we have only just succeeded in acquiring a fiche duplicator (which is part of a package proposal recently accepted by management to miniaturize as high a

percentage as possible of reports acquired 15 to 20 years ago, which the research staff is unwilling -- vociferously so, I might add -- to have us discard). Efforts will now be directed to encouraging the pack-ratting of fiche instead of hard copy, primarily by offering immediate service on fiche and readers, with delay (amount undetermined at this moment) for filling hard copy orders.

There are 2 Filmac reader-printers (an older 100M for microfilm, and a more modern 400M for both fiche and film) located in the Library. These are used sporadically, depending on kinds of, and deadlines for, various projects. However, to my knowledge, AEC microfiche are not among those so used. I foresee an increase in quantity of this kind of equipment, too, but have no timetable for when or how many. For the present, in case you are interested, we are foregoing the privilege of ordering DDC documents in microfiche, but I hope to change that within a year, as I think by then we will have an inhouse blowback capability that will be cheap enough to warrant restricting DDC orders to fiche.

In an organization-wide questionnaire on library services, issued in 1964, I included a question relative to using microforms. A majority of the 315 respondents agreed that they would, or could, use microfiche if they had to. Three years ago, such a question was purely theoretical. Today, faced with the actuality, my bets are on the "too much trouble -- I'd rather do without" school.

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Others can contain their enthusiasm.

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I feel that the main things to remember about microfiche are:

1. People generally will not use microfiche if they can help it.

2. There is no good, or inexpensive way to make hard copy from microfiche.

It seems to me that (2) is the chief obstacle to its use, and if this can be overcome, there is no reason why it could not get general acceptance.

In "look-up" situations, where only a page or so of print-out is apt to be needed, acceptance is generally good. I refer particularly to the Micro-catalogs put out by a commercial publisher. For anything requiring study, or even reading with close attention, I find that scientists and engineers dislike microforms of all kinds.

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Microfiche is only a small part of our collection. We have one title on microfiche - Journal of Physiology (London), and only part of its run.

This particular title has been used twice in microfiche.

No complications in use of microfiche. Our reading machines are: Mark VII Microcard Reader Corporation - 2, UMI Microfilm Reader - 1.

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Our library situation is that of the university branch library serving a faculty interested primarily in basic, not applied research. The literature of this area seems to be primarily journal and pre-print. Microform is used only occasionally. Exotics come in sometimes on film (dissertations mainly) and fiche is received by our aerospace engineering students. First encounter with microform is usually fun until the novelty wears off. Continued use of microform gives rise to fatigue, irritation and eventual non-use. Or so I have observed in 12 years of the academic environment. I have long felt that microform is a great storage device but that the customer should have full size hard copy.

As of now we have no reproduction facilities - we have a few film and fiche readers. The engineering graduate students are getting fiche now

from DDC and seem to be missing the pre-July 1, 1968, days when they got AD's on hard copy. The volume is still small and we still don't have a clamorous problem. But we should get a printer.

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The faculty and students make little use (246 items were circulated from R&D report collection last year). When they are confronted with a microform they may scan it but in all cases they make a print out which is usually of the entire report. They seldom ask for a paper copy to be obtained even though this would be less expensive. None of them like microform although some say we should have our back files of journals in this form. This is only when they consider what the cost of storage and back files run into. We have no means of reproducing fiche from the original microform. Most fiche which we receive are quite good and it is only when the original copy is poor that we get a poor reproduction in microform.

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The proliferation of the printed word has become a familiar refrain to even the most cloistered technician, engineer and scientist; his desk buried under mounds of unread reports and stacks of technical literature. Abstracts, KWIC indexes and selectively segregated subject dissemination alleviates some of this pyramiding. Fiche is tidy, complete in content and can be adjusted quickly to single page concentration; if a good reader is within arm's reach and if it is also a fiche printer, repugnance melts into begrudging acceptance. It still remains a new art form to the conservative and it is, therefore, difficult to get a constructive reaction to its use.

XXX is a subscription library. As apposed to a free library service, XXX must guarantee certain user satisfactions to remain solvent. XXX has an overwhelming collection of fiche, a reader and a printer. Several subscribing libraries accept reproduced copies of fiche; a few borrow fiche and reproduce them in house. Being a middleman XXX seldom gets a direct user reaction to this form of microreproduction.

Several years ago I did a hasty sampling of fiche use for a then member of the COSATI. The statistics for the report were gathered from both large and small technical libraries in the greater Los Angeles area. I had no initial source distribution list. I therefore hypothesized from incomplete data. The results were, however, disturbing as they reflected wasteful and costly duplication. The inescapable question was: do the advantages of individual library holdings compensate for receipt, handling and storing of fiche collections?

Figures given me by one branch librarian of a large defense contractor (each of whose various divisions has a library with duplicate fiche collections) indicated that it took one file clerk a 40 hour week to receive, file and handle them. Multiplying this case history by all industries in the greater Los Angeles area rather defeats the original economically based reason for this form of microreproduction. A central file seems indicated.

CHAPTER VIII

INDIVIDUALS AND MICROFICHE

The following replies were received from 136 individual users:

	For	For, with reservations	Against
Industry	17	18	36
University & non-profit	7	4	9
Department of Defense	9	9	12
NASA	2	--	3
AEC	2	--	3
Other Federal agencies	4	--	1
	41	31	64

The sample size is too small to justify statistical analysis within the rows. Therefore, I have pooled the responses from various sources in the following discussions.

Remembering the stringent criteria I set for "For", the 41 enthusiasts for microfiche constitute a fairly rigorous counterproof to the statement "No scientist can (or will, or should) use microfiche." Conversely, the 47% who were "against" left no doubt as to their opinions.

CHAPTER VIIIA - THE ENTHUSIASTS

Reasons for liking microfiche

Building personal reprint collections	17
Save storage space	17
Ease of retrieval manipulation	11
Availability of scarce material	5
Low cost of fiche	4
Ease of dissemination	3

Building personal reprint collections

One of the assumptions with which I started this study was that one logical use for microfiche would be in personal reprint collections. That this is the case is shown by the following excerpts:

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In recent months (since July 1968) I have started to request report copies from DDC in microfiche form. I have a Bell & Howell Mascot reader and at this time I have about 50 reports in microform. I've been developing my personal specialized library since about 1959 and have about 500 regular size reports. These reports occupy about six deep filing cabinet drawers. I'm convinced that microfiche is "the way to go."

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Personal files are the backbone of any technical person's storehouse of knowledge. Several years ago I started converting mine to aperture cards. I now have some 250 documents (some 2500 pages) of information in one card tray in a desk drawer. This would require about three file cabinet drawers for hard copy filing. New material going into my file will be microfiche or jackets. I am even planning to put all of my income tax-files and other personal papers on fiche.

Of course, part of the reason for this is self-defense against the paper deluge. Microfilm has been most helpful in my case.

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I am a consulting statistician at the XXX Park Division of the XXX Company and, as such, must have access to large number of technical journals and individual reprints. Most of this material is for occasional reference, not used from day to day.

I have put my entire reprint file on 5 x 8 microfiche, packing them solid, about 110 pages per fiche (i.e., there may be several articles on one fiche). The fiche are serially numbered. I have all of these articles indexed and the index reference includes the microfiche number. I would estimate that I have a file cabinet's worth of reprints in about 250 microfiche. In addition, I am also microfilming some of the technical journals which I use but not enough to make it worthwhile binding them.

Some government articles on statistics already come in microfiche form and any material our library obtains for us also comes on microfilm. For me, the microfiche system has been a great space saver.

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We find microfiche to be not just satisfactory but even preferable as the means for some portions of a personal report collection. We acquire some reports with a motivation not very different from that of a stamp collector. Experience has shown us, however, that this approach sometimes pays dividends. Obscure information is immediately at hand (rather than in the central library, or at DDC) when an unanticipated need for it arises. From another standpoint, some reports have so little in them that they aren't worth keeping in full-size hard copy.

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This command has sponsored an annual symposium on wire and cable for the past 17 years. We have recently forwarded all copies of back reports to DDC, as well as a KWIC Index of the first 15 years. It is our current practice to provide DDC with copies of all papers presented at the symposium annually. I maintain a master file of all of these reports on microfiche which constitutes the permanent record for the symposium. These microfiche also permit me to perform a literature search on projects related to our R&D activities in wire and cable, as well as to provide interested personnel at this command and their contractors with copies of partial or complete reports of interest to them. In addition, we are frequently requested for copies of back issues from all over the world, and the availability of microfiche from CFSTI provides an excellent means for disseminating this valuable information. I find these microfiche very convenient since I have easy access to a reader-printer, and am able to maintain a compact file of these valuable documents, thereby considerably reducing my volume of file space.

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I should like to register my vote for microfiche. I maintain a rather extensive personal technical library. I am now in the process of reducing the space requirements by several orders of magnitude. I also find the negative images of microfiche to be easy on the eyes, the operation of my viewer easy, and the scanning of reports expedited by the use of microfiche. In conclusion, I am a great fan of microfiche.

I have been using microfiche for the past three years, to a limited extent, where the microfiche has been provided in place of microfil. The ESSA Environmental Data Service has made the change-over, and I have found it possible to use the microfiche with the microfilm reader-printer which I have had for several years. I should add that I have five lenses of various sizes for the reader-printer.

I am particularly pleased with microfiche because the indexing and retrieval can be accomplished much more quickly than in using rolls of microfilm. Also, the updating on a monthly basis, as is done by our agency, is much more satisfactory on microfiche than on microfilm because the storage of a single sheet of microfiche uses less space than the storage of an additional reel of microfilm.

Let me say that I have a microfiche collection. I get a backache everytime I use my Xerox microfiche reader. But I must also say that I find the storage of the collection most convenient and the acquiring of the papers and documents very cheap. This is even more the case this year, since we have Air Force research contract. The best thing I like about microfiche is the ability to shuffle through them and find papers quickly. The size and the little packets make it possible to shuffle them like cards. I have mine arranged by a very simple key word category as a personal file. I simply write on the back of the little white packets that the Clearinghouse provides with each packet of microfiche; a word or two.

I have some 14 years experience as a propellant chemist and rocket designer. I am already incorporating COSATI negative

microfiche into my personal files, adding it to my existing 4x6" files, and planning on optical readout almost exclusively. Phases two and three above are of great interest to me, offering much improvement in my files and the utilization of them.

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As an engineer, I find that the advanced development program for which I am responsible requires that I study a large number of government-sponsored research reports. The majority of these reports are available in microfiche. Since I need quick access to this material, and since the volume in hard copy would drive me out of the office, I have a microfiche reader in my office together with a file of reports on microfiche. For my purposes, microfiche is nearly ideal, considering legibility, convenience and availability. For me, the key feature of this arrangement is the existence of a microfiche reader and report file in my office. I feel strongly that acceptance of microfiche by technical people will depend on quick access to readers and microfiche files.

For the future, I would expect that as use of microfiche becomes generally accepted, the library function in a research and development laboratory would become partially dispersed with many microfiche duplicates of frequently-used material and a large number of readers and private files. Combined with this, one would expect the laboratory to have a few reader/printers, for occasions where hard copy is essential.

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I have started a microfiche personal library for the following reasons:

1. Some documents I need are available only in microfiche form - for example the listings of the monitor and its subsystems for the IBM 1130.

2. Expense - As I have no financial support from an external organization I cannot afford to always order hard copy from the Department of Commerce Clearinghouse.

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I heartily endorse the use of this medium for the storage and distribution of technical data. Several currently available readers of modest price and a recently introduced dry printer have made the fiche technique the most feasible and economic contemporary procedure for handling large numbers of technical documents.

My work requires that I acquire, store, retrieve, and redistribute information relating to the physical properties of organic compounds and their mixtures. Several years ago the volume of material which I had to handle was such that I foresaw the approaching time when I could no longer handle this information as paper files.

Consequently, we began to convert our paper to microfiche. Fortunately, we chose a fiche size very close to that which seems to be coming into general use: 104 by 147 mm. Thus, we have been able easily to integrate into our files the reports we have acquired from government agencies such as the one you direct. The cheapness, speed of handling, and economy of storage with microfiche continue to please us. Also, the low cost and high quality of several currently available fiche readers have increased the ease of employing this technique.

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<u>My favorite letters.</u>

I started collecting ASTIA distributed reports in hard copy format in 1964 while at North American Aviation. In 1967 having accumulated about ten shelf feet of material, I purchased an inexpensive ($100) reader and switched to microfiche.

The change immediately solved the problem of storage space. Retrieval became easier because it was natural to file the 'fiche in a box by report number, and to return each item to its proper place after use. I started Xeroxing pertinent pages from the TAB abstracts section and maintaining them in a ring binder in chronological order, with my acquisitions checked off. I also kept a binder of selected

index pages. My acquisition scope broadened from immediate pertinence to work at hand, to the wider field of my professional interest (computer and information sciences). I have recently entered a subscription to the Clearinghouse's CAST series, and expect that this will supplant my xeroxed abstracts.

I have recently had white, opaque striping applied to the title block of each report and discarded the envelopes. This reduced the volume of my file by half. I would recommend this as standard practice for the distribution agencies; NASA already does this, of course. I feel the documents are easier to manipulate and browse without the envelopes, and have had no trouble with misplaced sheets.

A problem which was encountered with two of my previous employers was a cumbersome ordering procedure. In each case the technical library's policy required a form filled out for each individual document with name, employee number and full internal address on each copy. The library would then set in motion the same ponderous procedure they employed in purchasing books. Finally a stack of DDC Form 1 cards would emerge, all painfully typewritten. When the documents arrived they would indulge in another orgy of bookkeeping before loaning me the material. I managed to handle my part with rubber stamps and computer output typewriters. However, my reception by the library staff was not very cordial when I would walk in with fifty or so requests.

Fortunately, my current employer's library is content with a simple list of AD numbers and allows users to fill out their own Form 1's. I hope this is now the trend.

I find microfiche quite comfortable to read. My reader (a University Microfilm model) is satisfactory except for having the 'fiche holder on top; this causes some tiring of the arm.

There are certain retrieval aids I would like to see made available: abstracts on 4 x 6 cards for interfiling with the 'fiche; micro-indexes compiled for documents in a given COSATI field; an interactive time-shared data base. These services might be made available from the government, or by the private sector if the tapes generated in the abstract publication process were made available.

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My husband is a research hydrologist with the Systems Analysis Laboratory of the U.S. Geological Survey's Water Resources Division; I have recently completed course requirements and am now working on a thesis for a master's degree in information science at Drexel Institute of Technology. We both are document accumulators.

Last March we realized that we were ordering more and more reports from CFSTI and DDC and envisioned an eventual decor of wall-to-wall filing cabinets--rather depressing. Although we would be first in line to buy one of your proposed cuddly microfiche readers, we are quite pleased with the Atlantic F-66 reader that we bought upon the enthusiastic recommendation of a Drexel classmate who has one.

The design of this reader does have the advantage of encouraging concentration on the task at hand, e.g., it is not convenient to watch television while reading fiche. One difficulty, however, has been finding a table of comfortable size and height for reading. For the screen to be at eye-level, the reader should be on a table three to four inches lower than usual. A typing stand is about the right height but is too small for copying citations or taking notes. It has taken a bit of hunting to find an appropriate table; we recently discovered that the SCAN furniture stores sell a table with easily adjusted heights. We have also talked about getting a table like those used by hospital patients so that we could sit in an armchair or read in bed.

The easy storage and low cost of microfiche compared to hard copy is certainly appealing. I doubt that we save any money, however, because we buy three times as many documents as we would if only hard copy were available.

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Reasons for liking fiche - convenience.

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XXX/Convair Library now has hundreds of thousands of reports on microfiche and I am a booster. I'm Supervisor of Test Data Processing Service and have a Bell & Howell Mascot for my group. It

is an inexpensive viewer but portable and handy. Focus has to be tweaked from top of page to bottom sometimes and if I have it on my desk and lean back the bright projection lamp shines in my eyes --it is still more convenient than filing hard copy reports.

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I like the simplicity and ease in skipping between pages in reviewing a document quickly. All of my file is from CFSTI. Cost is the factor that prevents us from generating microfiche internally.

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Convenience is decidely self evident in my mind. File compactness, ease of handling, ease of mailing, low cost, etc., all tend to prove the convenience of Fiche. There is a psychological factor involved also. The sheer bulk of many reports is often enough to discourage the reader. Fiche, simply because of its compact size may overcome this.

Microfilm is convenient enough that we are using it on the production floor for process specifications and similar files. Most engineering data listing operations work with microfilm. Our engineering manuals have been converted to microfiche because of its convenience. In general, it is accepted more every day as people become aware of its convenience.

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Although I am newly oriented to microfiche, I find it most useful and a practical method of information retrieval and collection. The sequence I follow in brief is:

1. Our Librarian circulates a list of microfiche communications and I indicate my selection along with that of others. (For example, "Fast Announcer", U.S. Dept. of Commerce, Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151).

2. The microfiche is ordered by the Librarian and we are notified upon receipt.

3. We go to the Library, obtain the microfiche from the file located in the microfilm room.

4. We use a reader-printer manufactured by 3M Corporation. (Thermo-Fax Microfilm Reader-Printer.) Vital information for further study or use as a work sheet can be obtained on the spot by making a copy.

5. Specific points are:

Legibility - satisfactory (film and copy)
Convenience - satisfactory (entire sequence of retrieval)
Availability - satisfactory.

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We have a Microfiche Reader, Model FR-5 available for use in our Division. In keeping abreast of new developments in the nuclear safety field, we frequently request copies of documents for review and sometimes retention. While full size copies usually cost several dollars and are bulky to mail, microfiche cards can be purchased for $.35 and are easily mailed. The FR-5 Reader is a convenient desk size and easily used. The only disadvantage I find is in locating pages in a many-paged document. Some method of interval advance mechanism on the machine would be useful.

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On the positive side - the library is able to subscribe to perhaps three times as many journals and reports (in microfiche) as it would if only hard-copy was available. This is due to both reduced acquisition and storage costs associated with microfiche.

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As you may recall, when I was in AFOSR, I had in my office bookcases consisting of eleven standard 33-inch sections. And they were crammed full. Here I am reduced to four sections. My office is too small to accommodate more. I therefore had some hard choices to make. After throwing out several cubic feet of reports I decided were no longer of any value, I was still faced with several linear feet of things which just wouldn't go on the shelves. So, I sorted out those that I felt I would refer to frequently, and shelved them. Everything else, which can be categorized as either "I don't use that very often, but when I want it I want it in a hurry," and "There's some very useful information in there, which I might want in a hurry someday," is being converted to microfiche. I already have a several-inch stack of microfiche, which replaces several feet of hard copy. So because of space limitations, I am converting a good deal of my reports library to microfiche.

Why not replace everything by microfiche? Have I become an enthusiastic convert? Absolutely not. The change was the result of dire necessity, and I wouldn't have done it if it could have been avoided by any reasonable measure (throwing out everything falls under the heading of "unreasonable").

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I find them useful for casual reference to journals otherwise out of print. The microfiche photos of old plant specimens in herbaria available through the International Documentation Centre, Zug, Switzerland, have been warmly received by botanists including me.

Microfiche is infinitely superior to microfilm spools for the casual user because of ease of handling. I mostly use a 15X binocular microscope to read mine unless prolonged use is required. Then I use the compact IDC reader. We plan to assemble limited microfiche bibliographies of scattered journal articles by using a microfiche of the article as the bibliography file card. IDC is interested enough to work with us on this project being carried out as an activity of the Pacific Science Association subcommittee for bryophytes and lichens.

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I like the ease of filing and retrieval of microfiche. Most text reproductions are adequately sharp to present no reading problems on my 19x reader distributed originally for users of the Thomas Register. With this reader upside-down graphs or tables can be a nuisance though. Newer readers can rotate the microfiche, but they cost more.

Attaching a list of references to a memo is also easy when you have microfiche copies of reports: merely xerox the title strip of a string of documents suitably superposed; up to 13 reports fit onto an 11-inch sheet. The same technique also works for security logs or transfer receipts in the case of classified reports.

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Indexing can be somewhat of a problem. I chose to have my fiche numbered sequentially. The service company that films my journals numbers the fiche and keeps a record of the corresponding article, title, journal, author, etc. Incoming fiche with titles are also assigned numbers and the title and so forth recorded as before. The film index is currently on 3 X 5 cards, but I am also looking at alternatives such as Rotodex, etc. There are several advantages to this approach: it is less expensive to have numbers put on new fiche rather than title, author, journal, etc.; each article can be put on a separate set of fiche and multiply indexed in the card file by key words, author, etc.

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I found microfiche convenient to use and perfectly legible. In many cases, legibility of the microfiche was superior to that of many a hard copy.

Acceptance by my colleagues at this Research Center has been very good, after some - not unexpected - initial grumbling.

I might add that, because of our good experience with microfiche, the operating divisions of my company are introducting, or planning introduction of reader-printers at various other locations.

I have recently re-organized my personal library around microfiche. While I subscribe to only about 25 technical periodicals, the storage requirements quickly exceeded the space available. More importantly, retrieval of information in these journals and reports was difficult and time-consuming.

This left microfiche. The more I looked at it, the better I liked it. There are many microfiche readers available in the $100 - $200 price range. The single greatest source of important technical literature (the U.S. Government) has standardized on microfiche. Reports from the Clearinghouse which cost $3 or more (thus limiting their availability) now could be had for $0.65. I could afford virtually every report of interest. Inquiries to my professional societies (ACM, IEEE) indicated that they would eventually standardize on microfiche. Periodicals can be filmed monthly. Reports of whatever length are easily accommodated. Microfiche can be conveniently stored in standard office files. Existing journals can be inexpensively shot on 16 mm film and inserted in fiche-type jackets. Existing 16 mm and 35 mm film can be inserted in fiche-type jackets. Diazo copies of fiche or jackets are very inexpensive. Each article in a journal is individually accessible.

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Storage Space

Reference your letter to John Howard of 27 June 1968. I obtained an inexpensive reader and started using microfiche as much as possible this year. Many reports contain a page or two of data that is needed for particular problems. These are easily reproduced full size by our library copying machine.

The necessary bulk of full sized reports required to order and keep around in case some other of the pages are needed sometime exceeds the storage available in most research offices and probably inhibits requests for documents that actually turn out to be useful. I would be delighted if the scientific journals offered microfiche as well as full-sized volumes for similar reasons.

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I personally am attempting to convert my complete collection to fiche. I finally worked out a filing system using something akin to a shoebox. Volumemetric requirements reduce by orders of magnitude, and in an agency that is dedicated to the linear feet of file drawer criteria, it helps make brownie points. Someday they will probably get on the feet of shoeboxes bit, but ...

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Its use would be very helpful to the records retirement efforts and would reduce the office filing requirements by an order of magnitude and release precious floor space for personnel thus reducing the cubic foot rental costs per government employee.

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First, to my mind the microfiche system offers several advantages. These include the obvious ones of saving space and cost in storing and purchasing reports. In my opinion, very little convenience is sacrificed, if a number of portable viewers such as those manufactured by University Microfilms are available to the user.

My second comment concerns the overall philosophy of distributing report materials to contractors and other users. The comment actually falls outside the subject requested in your letter, but I am passing it along anyway. To my mind, distribution at no cost of government reports to contractors acts in a very prejudicial fashion to unfunded researchers. It seems to me that this distribution places the unfunded researcher at a further disadvantage with respect to his funded colleague. My comment is really a question: Has any consideration been given to distributing reports on a complimentary basis to all interested researchers whether funded or not? I would very much appreciate receiving your comments on this matter.

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I can not speak for all of the XXX Engineering personnel, but among our own group, interest and preference for microfiche is high. It seems to be a much better way of storing information in that it requires much less space than hard copies of documents. The trouble is that we do not have any reading equipment in the Engineering Building, and are forced to drive about two miles to our corporate library in order to have access to a reader. We think that when readers are provided at convenient locations in the Engineering Building, the acceptance of microfiche will be high.

I personally am starting a report collection of external documents from the Clearinghouse, STAR Index, and the like, all on microfiche.

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I have been ordering Clearinghouse documentation in the form of microfiche for about two years. Our Division Library has also encouraged the ordering of microfiche copies. However, I am certain that the motivation for this can be traced in part to budgetary reasons. For my part, it is for reducing the clutter in my office.

Occasionally, I order hard copy, but only of those documents which may need to be reproduced in part for distribution. This requirement could easily be obviated by the availability of a low-cost microfiche reader-printer.

There is no question that the economies derived from the price differential, and the economy of space required by the user are significantly important. As for utilization, I inherently feel that documentation of the type requested by the scientists and engineers is read only once. For the most part, it is then relegated to a file drawer "just in case" it might be useful at some indeterminate future date.

Also, I am a user who is on distribution for SCAN and GAB. I now request material from SCAN and GAB in microfiche only. Since I

have access to the library's microfiche readers, I do not have a reader of my own. This morning I received a microfiche copy of A. G. Hoshovsky's paper on SDI which appeared in the Clearinghouse USGRDR as AD-668072. I find that microfiche are a little more difficult to use because I have to leave my desk to read them. But other than a trip to the reader, I find they store a lot easier. The library has a reader-printer and if I need a page or two for hard copy use I can make it at my convenience. I have not yet found any reports in fiche that I need in hard copy which is to say, in a rather negative way, the reports I have been getting are in my interest field and I am keeping them, but they are falling off the mark of my interest to have them in hard copy. I do believe that if reports were free in hard copy, I would rather get most of the reports that I order in that form. However, I am not at all upset to have microfiche. I expect to build up a microfiche report library for my own use.

I frankly think that the future will hold more and more use of microreductions. I am thinking of replacing bound volumes in my periodical collection with microfiche. For the near future, I am planning to use a Xerox copier which will provide hard copy of microfiche for my projected periodical microfiche collection. At present, I am using Xerox 720 to provide reprints from bound and unbound journals. Since I am now providing hard copy reprints from my journal collection, using a Xerox machine to produce hard copy from microfiche will continue the same service. We probably will attempt to service our future reprint requests with microfiche reproductions whenever we can, but this is something for the future. The major effect of replacing the bound journals with microfiche will allow us to live within the space limitations the library has. We will replace journals with long runs and probably those before 1950.

Reading Time.

I have found the microfiche-Thermofax route to be invaluable in building a library pertinent to my interests, and religiously comb through section 5H, 6D, 9B, 12A, 13G, and 14E of the indexes. Since my reading time is at the saturation point with technical journals, technical magazines, controlled-circulation magazines, books that I buy and books that I borrow from a general library and

from a University engineering library, the ability to squeeze in a few selected technical reports from CFSTI and DDC each month is a genuine advantage. In preparing the occasional technical report required by my work, I haven't found a better way of building an effective and irredundant bibliography than the microfiche-Thermofax method.

And Theft Proofing!

I use and prefer Microfiche since I receive five to ten reports a month from the Clearinghouse for Federal Scientific and Technical Information, and normally read only the abstract. The XXX R&D Center Library is using Microfiche and I receive their reports in this form. Engineers and patent attorneys have a habit of losing my hard copy, so I am only going to give Microfiche copies which are obtained at our R&D Center Library.

I am sure that you realize that my comments are for unclassified documents. For classified documents, I believe microfiche are a good thing. They are easy to file, can only be read under controlled circumstances, they are hard to duplicate, and convenient to destroy.

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In Summary.

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Generally speaking, I find microfiche more effective for the following functions:

1. Information Protection - Usually cheaper and simpler to store.

2. Information Conservation - Microfiche copies serve to protect the original records from possible wear and tear or loss in use.

3. Space Conservation - Prefilming costs are low because the records are of uniform size, in consistently good condition.

4. Publications - Microfiche use for publications has increased because it can produce compact copies of large information collections for far less than the cost of producing a like number of copies by conventional publishing processes.

5. Systems - Microfiche is done while the document is being processed - best, as a by-product of the processing. Results - reduced size, elimination of clerical handling and multiple typing operations.

Microfiche is not itself a problem solver. It is not a total answer to information handling problems. It is, however, a management tool of exceptional potential when used at the right time, in the right way.

CHAPTER VIIIB

THE RELUCTANT CONVERTS

Almost one-fourth of the respondents had mixed feelings about microfiche. Unlike the enthusiasts in the previous section, who tended to regard microfiche as the greatest invention since sex and sliced bread, these respondents saw both the potentialities and the present flaws of microfiche. A paradigmatic sentence from the replies I placed in this category would be "I like microfiche, but....."

These are the middle-of-the-road respondents whose opinions can, at least statistically, make the difference between overwhelming rejection and more than 50 percent acceptance of microfiche. These are the swing voters. Their objections should carry maximum weight.

Read the following sagas:

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Chronological Birth of a Microfiche User.

Attended Small Business Administration briefing session. Defense Documentation Center representative explained services of DDC. First time we have heard of microfiche. Facts, and handouts, filed away for opportune time.

Received government contract.

Went to local college library and tried out microfiche to see what it was like. While the reader there was poor, i.e. had fuzzy image around edges of page, the advantages of space saving were obvious. In addition, since most reference material sits around for 99.99% of its life, waiting for its brief moment in the sun, we felt that the bother of getting a microfiche reader and having to sit at the machine

to read any document was far outweighed by the space and cost savings in "going fiche". All this was further emphasized by the fact that one half the walls in our office are already filled to capacity with bookshelves, which in turn are filled to capacity, and we are just getting started!

Immediately contacted DDC.

Received DDC user code and supply of DDC Form 1.

Began to receive microfiche copies of reports.

PROBLEM: Making index cards so the reports can be catalogued and retrieved.

SUGGESTION: Since most microfiche ordering and processing is computerized I suggest that 3x5 index cards be furnished with each fiche OR that some standard frame on the fiche contain the information OR that the yellow computer card that DDC sends with each fiche be imprinted with the information. This information is readily available since DD Form umpty-ump requires each author to prepare an abstract of his work AND give the keywords for retrieval.
Microfiche, and any other information, is useless without a proper retrieval system. If the fiche is low priced but the individual user has neither the time nor finances to make out the index cards then the entire fiche concept stands to suffer. Supplying index cards in sufficient quantity for at least a subject-author index with the fiche is easy to do at the source of the fiche.

Fine, beautiful. We have microfiche. How do we read them? Obviously, get a reader. But how and what do I look for?

DDC has two free pamphlets that tell what readers are available and prices (both subjects out of date) and the second is sort of a consumers guide to the microfiche world, i.e. what to look for and what to avoid.

Wrote all manufacturers of the simplest, and least expensive, readers as per DDC Pamplet.

Asked contacts in the business machine world to keep eyes open for a used reader.

Began to receive replies from manufacturers. About 1/4 no longer made readers. The others send advertising material.

At the present time, I have had one demonstration and have requested three more. The choice seems to be settling down to the Eastman Kodak EPCS series, the NCR 400 series, the Atlantic F-66 series, and last and the most undesirable--the Bell and Howell Mascot portable. The cost is close to $200 in general, and it seems to me that with plastics and mass production a good quality reader, with no frills, should be available for $30.00 or so. After all, a reader is basically a very simple gadget which most of the manufacturers have complicated. The optical system is the critical part. If good cameras can be sold for $30.00 why not a reader for the same price.

Even without a reader, we are thrilled with the idea of saving so much space and yet having so much technical and useful information handy and immediately available. We expect to have a reader within the next few weeks.

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Others have passed these initial hurdles.

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I have about 13 unclassified DDC reports on microfiche in my desk drawer. All are basic reference reports I once had in hard copy but they were all fairly bulky and the hard copy versions have either been discarded already or are in danger of discard when the office gets too deep in paper.

I have had occasion to refer to about half of them on an Atlantic F66 viewer. I expect to continue to refer to these occasionally and to add more reports to my fiche-file.

My major conclusions are these:

DISADVANTAGES OF FICHE: (in decreasing order of importance)

1. Viewer not always available when needed (we hope to correct this).

2. I can't make notes in the margin to record my comments while reading. Its very frustrating to be unable to mark up the report with underlining, questions, criticisms, cross references, indices (where author failed to provide), etc.

3. Poor quality of the fiche, caused somewhere along the line in DDC occurred in two of the documents. Could still read, but quite unpleasant.

4. Viewer problems: focusing not uniform across screen, glass plates get dirty, reflections on screen, screen a little too high when viewer on desk top.

5. Photographs are largely lost in the process (example: AD817131, RADC Compendium of Visual Display Devices).

6. I can't read the fiche on a plane or at home when I need to do some work away from the office.

ADVANTAGES OF FICHE:

Only compactness, but this is a very crucial advantage for me, since our library services are not close at hand, so a fiche in the hand is worth two hard copies in the library.

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I was first introduced to microfiche as a practical means of accessing information when IBM decided to distribute the listings of the 360 Operating System in that form. My employer, Washington University Computing Facilities, decided to purchase an IBM viewer in order to facilitate using the listings. Since the viewer was available I began to accumulate a sizable library of microfiche from the Clearinghouse for Federal Scientific and Technical Information. I utilized the significant price differential in favor of microfiche to obtain more documents than I would have if I had gotten only hard copy. In other words, within a given budget I could affort to be less critical in my selection of documents and satisfy a broader range of interests.

I am familiar with microfiche only from IBM and CFSTI. IBM is, in my opinion, using microfiche very well. Particularly in their weekly 'Early Warning System' mailings. These documents are prepared and indexed for microfiche use and utilize the coordinate positioning available on the IBM viewer. It is unfortunate that IBM and CFSTI are not compatible with respect to size and page arrangement, however CFSTI microfiche is perfectly readable on an IBM viewer. My strongest complaint about CFSTI doucments arises from the difficulties in reading a page that has been written sideways such as a large table or drawing.

In general I am quite pleased with my experiences in using microfiche. The usual objections of being unable to write on the document does not bother me as I was brought up under the discipline that writing in books and publications was not permitted. The difficulties of examining several places in one document simultaneously or of examining several different documents have bothered me. Obviously these problems could be overcome by more elaborate viewers and better document preparation for microfiche use.

The lack of widespread availability of viewers is, in my opinion, the greatest obstacle to wider usage. I am attempting to modify a discarded aperture card viewer for my personal use at home. Commercial viewers are prohibitive for personal acquisition. The University library has several microfiche viewers of various types available for general use in the library, but they were somewhat taken aback when I produced my own microfiche and asked to use a viewer. One compensation in that regard however, the exit custodian in the library does not recognize microfiche as library material and had never questioned my possession of it. (After all he examines books!)

I hope this letter will be of some value in your study. I have found microfiche to be a very acceptable way of maintaining a library of reasonable size which does not require everyday and regular reference. Perhaps my biggest gripe is that I can't take the microfiche home at night to read and I am working on that.

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I am gradually converting my technical library to microfilm and microfiche, since modern copies are adequately legible, even to the exponents and subscripts. Reprints from microfiche still tend to be occasionally defective or illegible; it is better to read microfiche by projection. Frankly, I prefer full-sized originals, but it has become impractical and expensive to store them. Ordinarily, I use the projectors at work (XXX Space Sciences Laborat ry); the microfilm reader I made 25 years ago does not accept microfiche. However, I'm converting even at home, and hope ultimately to have most of my technical library or microfiche, particularly if we ever move to smaller quarters. At the lab, microfiche is essential.

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Microfiche can create filing problems.

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Trying to file both real life documents and fiches in the same physical system is impossible. Thus you must make a break sometime, somehow.

Let me summarize the major items:

1. As a working document, fiche is out.

2. Mixed mode filing is impossible.

3. Reading device quality is probably the biggest problem.

4. Each individual must have his own reader, one to serve a group just won't work.

5. File volume reduction, while obvious, is amazing.

6. There is no sense arguing, as your agency will probably convert to it anyhow, and who will listen to or heed your ideas!

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I have also noted some objection to microfiche among clerical personnel due to incompability of microfiche with their normal filing equipment and the ease with which microfiche can be lost or misplaced.

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Microfiche is itself most convenient. It is especially valuable in that one can afford to order on microfiche much more than one would dare order in hard copy because of the storage problem. Reading, not storing, becomes the problem. I have discovered though that while storage space is not a problem, getting appropriate containers for microfiche is one. I cannot seem to get through the channels of government a simple little box in which to place microfiche, perhaps in number equivalent to a stack 10 inches high. All I get is 3 x 5 card boxes (too small) or others much too large. This is a real pain.

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Including file conversion:

The second phase is the necessity of converting existing personal hard-copy files such as magazine clippings to microfiche or other compact format. The conversion would eliminate the maintenance of both 4x6" and 8 1/2x11" files, speeding up retrieval rate as well as reducing storage volume requirements. This must be done at low cost and preferably with "do-it-yourself" equipment that can be rented or leased at moderate fees.

There is equipment available to do this filming job for businesses, but none advertised that I know of for use by an individual for his own files! This may be a limited market, but to me it is a real market. These machines could even be coin-operated in a public location, such as a library.

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Fiche quality control causes some problems!

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Some copy, such as certain company reports, is very poorly reproduced. The letters are fuzzy or burnt out. This seems to happen if the original was produced by a method such as mimeograph. On the other hand, most technical reports produce an easy-to-read type size in our readers while technical journal type is too small. The common practice of binding all figures at the end of a technical report often results in the figures being copied on a separate sheet of microfiche. I have found no convenient way to refer to the figure and its caption while reading the text. While pictures are usually poorly reproduced, they are seldom satisfactory in Xerox copies either. This is a problem in papers on holography, interferometry, etc. and in any paper showing an experimental setup.

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This system furnished all documents on microfiche, almost from the start. (Note that the system sent me notifications, by checking appropriate boxes on these, I could either get the document or chalk up a mismatch). The early fiches, as we call them, left a lot to be desired. Readers were few and far between, and almost without exception contained atrocious optics. The fiches were mostly grey on grey (same scale, too) many out of focus, etc. After suffering through the growing pains, better readers became available through the wonderful system of each user's department having to buy their own, and the quality of the fiches improved. The user, too, got used to them. Until recently there was one major drawback, in that the document title could not be read without using the reader. This makes for a hell of aggravation when searching through a stack for a given document. The solution to that problem was to file the fiche with a 5 x 8 card containing the pertinent data, and hoping that the two remained in proximity from thence onwards!

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I find the use of microfiche an economical method for the purchasing and storing of reports.

The problem that occurs is the inconsistency of quality, due mainly to the original hard copy input, and the reproduction of the microfiche which is not consistent.

This complaint, though major, does not outweigh the advantages that occur in stocking my personal report file, many of which would have to be discarded due to lack of space.

The quality of readers is sufficient for general use. If I were a full-time user of a reader, i.e., four or more hours per day, I would say the readers have much to be desired.

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I find the lack of standardization annoying - IBM size microfiche is larger than US standard, although it is more legible.

Listings of FORTRAN or other programs on US microfiche are almost totally illegible on the reader (a small portable manufactured by 3M) which I use.

It is very difficult to ascertain the availability of microfiche copies - as far as I know there is no index of Clearinghouse publications, or, if there is, they won't send it to me.

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Our office recently acquired a Bell & Howell Mascot reader. Although the reader is not practical for extensive reference use, it does suit the needs of our office very well.

The convenience of being able to reduce 3 bookshelves of TABs to one with a reader and file box and a classified drawer to a handful of microfiche cards is a pleasure.

We have found, however, that scanning some of the fiche cards has been difficult since the focal quality is very inconsistent: i.e., very poor to very sharp.

Since our activities do not require extensive use of the reader, though, the problem is not as serious as someone who might use microfiche more often.

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Including some which are not its fault!

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On the whole, the readability of fiche is satisfactory. What is infuriating is when a page is missed in photographing and one is left to try to obtain the copy from a research institute on the Pacific coast of the States. (By the way, why have most Americans never heard of Air Mail for international mail?)

However, the main complaint which I would level against microfiche is not technical. As a distribution medium it has made it all too easy for useless and near useless literature to be distributed cheaply on a world wide basis. To my mind, quality control of input is a much more urgent need than quality control of the medium.

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If I could obtain further improvement of CFSTI and DDC service by making a suggestion, I would ask that (1) more pressure be put on originators of reports to provide good abstracts, and (2) that a microfiche service be provided for these abstracts (by classification section). The reason for these suggestions is that I have found some of the abstracts (as printed in the index) to be so good as a short summary of a significant report, that I would like to make and compile copies of these to serve as a "surrogate library" or a "library in esse" - but on the other hand, when I am making a topical search through the collection of reproductions that I have in my personal library, I am greatly provoked and frustrated by the willful opacity of many of the abstracts. They do not seem to be representative of the contents of the reports, but of the skill of the writer in creating

prestigious circumlocutions. This is not peculiar to the CFSTI and DDC reports, but has been a blemish in the technical journals since time immemorial. This leads me to observe that here is a golden opportunity for CFSTI and DDC to show the way out of this never-never land of pseudo-professorial smog.

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Even the proselytes don't like today's viewers:

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Microfiche as a medium for information storage is definitely superior to bound documents. This opinion is based primarily upon the extremely high density storage capability of microfiche.

What is sorely needed at this time is a high quality method of retrieving that information and displaying it in a manner that is as easy to read as a bound document. We have both portable (Bell & Howell Mascot) and stationary (Minnesota Mining and Manufacturing "400") readers; the stationary type being actually a reader/printer. Although the stationary model is decidely superior to the portable model, it still is not the answer in the Library and is not convenient for reviewing documents on a short term basis. Also, it is not capable of satisfactory reproduction of pages of tables, reduced in the original document.

The portable readers are not amenable to reading in a sitting position; that is, the angle of the screen in such that one must sort of half-stand in order to look at the screen properly when the reader is on the desk. The screen is lighted non-uniformly, causing consequent eyestrain. The focusing stability is absolutely terrible; in many cases you must change the focus within the same page in order to read the bottom of the page when it is originally focused on the top, and the focusing never remains the same from one page to the next. A capability of rotating the microfiche within the viewer so that tables and charts printed sideways within the document may be easily read is required.

In summary, I predict that the acceptance of microfiche as an information

transferring medium will be extremely marginal until more adequate reading equipment is developed.

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My company has a Technical Information Retrieval Center which will send out microfiche copies of articles which I request. I am building up a library of microfiche in spite of the frustrations I have with a reader. I have a small desk size reader which I use, and which I would use much more readily if there were a convenient mechanical means for placing the particular frame I am interested into position rapidly so that it would all be on the face of the screen and in a non-skew position.

In my experience, I am not aware of a suitable viewer-reader for the individual user. In spite of this, I still order microfiche reprints because the convenience in storage and filing these as opposed to bulky documents more than compensates for the viewing inconvenience when I have to refer to an article on microfiche.

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The equipment must be designed for the specific microform. Contrast and overall image quality could be improved. Too often, it seems, the printer doesn't work without calling in someone to "fix" it. I am told that copies cost 10¢ per page, which I consider quite high.

Microfiche offer clear advantages, but until the equipment is improved and widely distributed, please continue to offer the hard-copy option.

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I miss two things very much: the ability to underline and mark as an aid in reading difficult text, and the ability to mark for future perusing. Of course one could make notes on a piece of paper, but then one has to store and retrieve the paper when looking up the report again. I don't think that one can beat good quality, hard copy, personally marked-up (and paper-clipped) reports.

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Editor's note: If I felt very strongly about the desirability of underlining or otherwise marking microfiche I would equip myself with one each of the following items:

Retoucher's desk or light table
Binocular dissecting microscope, 20
Smallest camel-hair or sable brush
Dilute solution of new coccine

Since most fiche is negative, a swipe of a suitable laden brush across a line of the fiche should result in that line of type appearing in red (if new coccine is used) on the view screen.

I still haven't figured out how to do this without removing the fiche from the viewer. H. Wooster, 16 June 69

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I have found no objection to microfiche in my company or among the different scientists with whom I have worked, at least on the surface. On the other hand, I have also noted a low frequency of usage after the novelty of the system and the viewers has worn off. This seems to be due to the nuisance of having to obtain a viewer, the inability to annotate documents as they are being read, and the inability to make hard copy for bibliographic or other reasons.

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Availability of readers and reader printers seems to be the single, most prevalent complaint.

Knowledge of what industry has to offer is not widespread.

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In response to your letter published in the September issue of "Science & Technology", I have recently been introduced to microfiche copies of scientific reports. Because of their size, I find them

quite convenient to store and they provide easy access. When used with a suitable reader, they are quite legible. My problem is obtaining such a reader. The only one I have been able to find is a Recordak that is physically quite large and is quite expensive, costing in excess of $1,000. I have searched through various catalogs in vain attempting to find a reader for my use and therefore must travel to Washington, D.C., in order to read any of the microfiche reports which I have obtained. If you can inform me of a small microfiche reader of modest cost, I would be very interested in attempting to make greater use of microfiche reports.

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Nor are there enough readers to go around.

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We have a microfiche reader in our main library, and I have occasionally ordered from DDC microfiche copies of reports rather than hard copies. I find it very easy to read microfiche, and also it is much simpler to store and retrieve. Since we use the report literature daily in our normal course of research, it is awkward to go to the main library each time we need to consult a piece of microfiche for some data. Lacking a printer, of course, is an impossible situation.

Our librarian believes that there is no suitable reader-printer worth buying as yet. Cost and convenience of use seem to be the obstacles. Until the library can afford to buy a reader-printer, there is no possibility that I could buy one for my group's use at our location. Thus, I don't expect to find much use for microfiche until inexpensive reader-printers are available and can be justified for small groups to use separately from any central library.

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I use microfiche more or less at the discretion of our Technical Library. Internally generated reports and copies of articles owned by the library, all are made available in hard copy. But when copies of documents must be obtained from outside, the library chooses microfiche if it is less expensive than hard copy.

I find microfiche satisfactory from a legibility point of view. However, it is not so good from the standpoint of convenience. In large part this is due to my not having my own reader - I have to go to the library to use theirs. While readers are not very expensive, it is difficult to justify a separate reader for every potential user.

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Although I greeted the original conversion from hard copies to microfiche with apprehension, my thoughts have mellowed considerably. A lack of storage space for hard copies makes the microfiche conversion a most timely event. The usefulness of the microfiche copies is severely hampered by the lack of a conveniently located reader (nearest about two blocks away). This is a serious but simple matter of lack of funds which hopefully can be overcome.

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The reader or reader-printer is the weak link in the present chain. It is difficult to get management to buy one. It is even more difficult to get several, and several are needed if personal document collections are to be kept on microfiche. This is true in spite of the fact that a simple reader costs less than a couple of filing cabinets, filing cabinets which would otherwise be purchased sooner or later to hold hard copy.

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In a small office it is impossible to justify equipment that will copy microfiche in hard copy. This then stops us from forwarding portions of documents to other personnel as we have done in the past. Sometimes in reading documents, we would find a graph or page emphasizing a point that would be of interest to other STLO's or to people in the International Programs organization or in some cases, people in the S&T community here in Canada. It was very easy for us to make copies of the pertinent pages and forward them to these individuals. Now, the only way that we can transmit the information is to have our secretary

retype it from the microfiche. Obviously, this cannot be done except in rare instances due to our administrative workload. Therefore, this capability is totally lost.

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Engineers in the Design Division at this shipyard make good use of the technical reports obtainable from the Clearinghouse and from the Defense Documentation Center (although we are somewhat puzzled at the overlap of these two services). Nearly 100% of the engineers ask for hard copy, and do not know what microfiche is. The Design Division has four self-service 3M Thermofax aperture card projector-printers for 700 men, and since these printers will print six frames from a microfiche card on 18x24 paper which is easily cut in 9-inch strips to make booklets of three frames-per-page, I believe more use would be made of microfiches, and hence a better utilization would be made of the reports available, if more engineers were aware of the ease of getting a reasonably good quality of hard copy from microfiche by this method.

My opinion is that microfiche is impractical for anyone who has only a reader, although I may be biased by the fact that our readers (without printer) of which we have one per 30 men, are not well-suited for microfiche. Like the printers, they were made for use with aperture cards, but unlike the printers, the film holders do not provide access to all frames on a microfiche. I would insist on hard copy if I did not have the 6-frame printer, and I wouldn't be interested in microfiche if I were still restricted to an older model projector which could print only one frame at a time. We in the shipyard are very cost-conscious, and although I make my own copies after working hours, my present production rate of 1 1/2 hours for a 308-page report is about the limit of my patience. Reports of this length make up less than ten percent of the reports that I use. The average is around 75 pages.

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Information users will not use microfiche to any appreciable extent until readers are readily available - almost as handy as the nearest office typewriter.

CHAPTER VIIIC - THE AGONISTICS

Overture on kettle-drums

For day-to-day use of current reports it is a waste of time and money.

For the laboratory scientist microfiche is essentially useless.

It is a step backward in the program to improve the dissemination of scientific and technical information.

I tried to use microfiche. I gave it up after a few honest attempts.

Anybody who strikes a blow against microfiche can't be all bad.

I therefore feel very strongly that microfiche is almost useless to me as compared to full-sized reports.

Libraries and organizations do a disservice to the technical community when they restrict hard copy availability.

I have come to disregard many technical reports for data utilization that are available only on microfiche.

On page 3, DDC Digest No. 33 you say: "Microfiche saves space and money" to which I can only add: But not the eyes. It's horrible.

The man who ordered the present campaign to distribute reports on microfiche should be hung, drawn and quartered.

Microfiche is an information burial system.

It is very false economy!

The people charged with filing documents are very happy with it, but those who have to use it detest it.

Everything about microfiche is marvelous..except reading it.

It is a potential killer of regular professional use of reports.

I detest the things, and insist that no serious investigator can be happy about them.

They are great for pretty filing; useless for my purposes.

The current practice of NASA's technical information dissemination process of fulfilling technical report requests by supplying microfiche has succeeded in all but completely strangling the flow of technical information.

There must be a better solution than microfiche.

Overall opinion: DOWN WITH MICROFICHE.

My generic "Letter to the Editor" asked those to write who had been exposed to microfiche and had formed strong opinions about it--opinions strong enough to warrant writing me a letter about him. It is all too easy to dismiss those who dislike microfiche as ones who dislike reading and would seize upon any plausible excuse for not reading. The following excerpts give a different picture:

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User Background:

I have been an enthusiastic (since 1957) user of ASTIA, DDC, and now USGRDR. I have been working on government research for most of this period. The reports of our research have been indexed and available in these systems. I have depended upon the biweekly announcements as a principal source of current information essential to our work for the government in computer research. My typical order has been about ten reports per issue. I have felt that widespread availability of USGRDR was an adequate substitute for the normal journal publication and also permitted more extensive and rapid reporting to the benefit of other researchers and ultimately the government. This summer I have received 12 requests for copies of our reports that normally would have come to USGRDR. I wish I had hard copies available to supply these requestors.

Personal Reaction to Microforms:

I have at my desk 26 microforms. I have scanned 2 and studied none (the most accessible reader is nearby in the library). I cannot read the documents at odd times or places. I cannot conveniently refer the documents to others. I cannot annotate the documents for the subsequent benefit of myself or others. I cannot reproduce the documents so cheaply as the mass reproduction feasible at CFSTI. I find the four types of microform readers that I have tried all to be deficient in resolution, and impossible to adjust for a comfortable reading position. I find the "white on black" to be tiring. I subjectively feel that my reading rate is slower. Consequently, the amount of time that I am willing to devote to any one document is low (I estimate 1/10 that which I formerly spent).

The space required for a personal microform reader is comparable to the space of the one file cabinet that I now use to contain the indexed collection of selected AD documents from the last 9 years of my ordering. I do not feel that the floor space argument is significant for justifying the inaccessibility of information in microforms.

I now question the desirability of continuing to order my own copy of USGRDR and bothering to scan abstracts or place orders. The other users at XXX have apparently already abandoned this source of information. The last two months I have been the only individual to order reports, whereas before July an average of 15 users were served.

Unlike the reluctant converts of the previous sections, the writers whose opinions are quoted in this section have not made their peace with microfiche, and have no intention of doing so. These are the people, perhaps, who have been led to microfiche, and they don't like it.

The 47 percent of individual users who disliked, detested and despised microfiche did so for the following reasons, ranked in descending frequency:

1. Unavailability of, or difficult access to, readers for their own use.

2. Inability to make notes on fiche.

3. Poor optical and mechanical quality of readers.

4. Can't read fiche at home, on airplanes, etc.

5. Can't flip pages, refer back and forth from appendix to text.

6. True cost of blow-backs is probably greater than 25¢ a page, especially when scientists or engineers must operate the reader-printers themselves, as is frequently the case.

7. Print-outs after you get them are unwieldy, thick, curl up into Dead Sea scrolls.

8. Personal reading rates are slower.

9. Can't read and work with graphs, tables and continuous tone photographs, especially with negatives when they're accustomed to reading positives.

10. Can't identify fiche by color and physical location.
Can't scan quickly.
Poor indexes to what's available on fiche.
Hard to store.
Can't read titles without readers.
Lack of standardization in fiche size (e.g., COSATI vs. industry, vs. IBM standards.)

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For many years I have been in the position of having to do considerable literature work, in order to maintain a complete and up-to-date file on the properties of metallic materials and structural elements for aerospace vehicles. My current file occupies about 35 standard file drawers plus about 35 linear feet of bookshelf space. It is one of the more complete files on this subject in the Aerospace Industry, and is available for use or inquiry by all engineers at our company.

However it may seem, regarding our storage space problem, I do not believe that the present microfiche system will last. It appears

to be a temporary expedient, until such time as a system such as tape storage and automatic report preparation and shipment becomes feasible. Perhaps the following miscellaneous comments will assist in explaining this conclusion:

1. The effort required to find and assimilate all of the relevant facts in an engineering report using a microfiche reader is several times that required with legibly printed, properly bound copy. For this type of usage, the communication efficiency of microfiche is estimated at less than 30 percent of that of printing.

2. The engineering time required to determine the key pages in a microfiche report for copying purposes, make the copies on the currently available machine, and trim and staple the pages was found to be one hour. This amounts to several times the cost saved by the provision of microfiche versus printed copy. Also, the stapled pages thus obtained compared very unfavorably in usefulness, and ease of storage and retrieval with a normally bound copy of the same report.

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My office has been a steady user of DDC reports and we would be handicapped without them. Since the microfiche rule went into effect on 1 July, we have been compelled, of course, to use a reader. The fact that we must make a 10-minute trip to the Technical Documents Center where a few readers are available for common use is merely an inconvenience which could be overcome. But the reading of negative-image text is a real deterrent. Although it varies, of course, with the individual, I personally find that 20 minutes is my limit. Beyond that my eyes begin to water.

Unfortunately, we find that we have already begun to rationalize why we needn't bother to keep abreast of reports in our respective areas. We are taking steadily less time to review the DDC index. And we are ordering far fewer documents.

Microfiche is ideal for libraries and library research. But it is a potential killer of regular professional use of reports.

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Early in 1966 I queried the 38 scientists at NASA's Ames Research Center, Moffett Field, California, who were receiving NASA's SDI service in regard to their likes, dislikes, and suggestions for the system. At that time, they were receiving microfiche copies of reports they requested. The microfiche were reproduced at Ames on equipment good enough so it was not usually possible to tell the copy from the original. Each man had a reader available to him at least within his group, and usually within his own office.

One question on the sheet was as follows: "Would you rather wait four weeks to receive hard copies of N-number documents instead of receiving microfiche copies within a week?"

Of the 37 respondents, 23 said yes, 10 said no, and 4 did not answer the question.

Since microfiche were much easier for the library staff to handle, we were really pushing patrons to use them. However, most of the people I met at the circulation desk or through the SDI program strongly preferred hard copies.

My subjective impression was that the ones who read the most were the most outspoken against microfiche. Those who seldom had to use the fiche were more likely to be neutral.

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I have used microfiche for the past two years for many Clearinghouse reports and as a company, we are now heavy users of it because of the DDC policy changes which occurred in July.

The size is certainly convenient for library storage and organization, I would stress these criticisms of over-dependence on microfiche:

1. Inability of marking or making marginal notes which are a prime source of information retrieval to the user.

2. Relative slowness and awkwardness of referral to other pages for comparison of figures, etc.

3. Relatively poor quality of the optical path and the flexibility or fragility of the housings in the low cost microfiche readers currently available.

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Here at TPRC we are attempting to convert all our hard copy documents to microfiche. I have had to use microfiche for over a year now and here are my summarized opinions:

Legibility	fair-poor
Convenience	very poor
Availability	fair
Quality of readers	fair-poor
Reader printer	poor

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It has been my personal practice to request ASTIA titles when they seem to relate to areas of my technical interest. When the full sized hard copy versions were supplied, I found ASTIA to be a most convenient source of pertinent information. When half-size hard copies (two pages of information condensed onto an 8 1/2 X 11 copy page) were sent, I found these to be far more difficult to read but still usable. (Where equations with small subscript and superscript notations arise, reading of the reduced size copy can be most irritating.)

During the past month or so, my requests for ASTIA documents have been answered with the microfiche cards. I have found the use of the microfiche viewer to be so irritating and physically uncomfortable that I now avoid reading documentation supplied in microfiche

I believe that all of the microfilm viewer systems (not only the microfiche) are equally ineffective as technical document distribution equipment. I am not antagonistic to microfilm files, per se. Microfilm

files do serve good purposes; for example, I have used microfilm catalog files very successfully. The catalog file operation is primarily a rapid acquisition of one or two reproduced catalog pages, with the entire operation taking a very short time. In the case of most technical reports however, only hard copy use can really permit the type of thoughtful perusal that involves back referencing, forward skipping to check figures and illustrations, marginal notation, and similar handling necessary for the appreciation of most worthwhile technical documents. This sort of reading can only be done with hard copy.

It is hoped that some of the advantages of inexpensive distribution, which the microfiche system affords government agencies, can be retained without depriving the user of the advantages of full size hard copy reports. Perhaps high speed printing devices can be placed in industrial, academic, and major public technical libraries so that when the libraries have received the microfiche documents, a hard copy report can be quickly generated on the spot. If I cannot have the easy access and convenience of hard copy documents, then the information source loses its usefulness to me.

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I am an engineer in an organization (XXX) that is making wide use of microfiche. Readers are distributed throughout the office area. The reports that I read are highly technical and use many equations, graphs and tables.

My opinion is that microfiche is one of the worst calamities to befall engineers. After wasting considerable time and completely losing patience, we order a hard copy. Since our principal customer is the government, it is the taxpayer that is paying the excess costs that go with microfiche. Anybody who strikes a blow against microfiche can't be all bad.

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In the course of my work I scan seemingly hundreds of reports from government agencies each month. Because of the expense of mailing

and storing hard copy, I tried to use microfiche. However, I gave it up after a few honest attempts.

I first had to go to a reader - preferably a reader/copier, then scan the microfiche. Each time I encountered a page of interest, I'd make a copy of it. At ten or fifteen cents a copy, I in some cases spent more than hard copy would have cost in the first place. As an editor and writer, I must have copy to refer to and mark on, and microfiche in itself does not do the job.

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I detest the things and insist that no serious investigator can be happy about them.

1. They defy scanning - I cannot go from the text to the artwork (usually in back on reports); I cannot refer back to earlier sections readily, etc. They are not made to fit in with my reading habits.

2. We cannot buy printers for making hard copies -- costs + red tape involved. At NOL, I am told, I couldn't get a printer for 1-2 years.

3. Out of many hard copy reports I used to tear out a summary page, or an abstract, or sometimes a graph or table to file for future references. No dice on microfiche.

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I find microfiche completely useless! Following are the reasons:

1. Microfiche requires special readers. I can t even see what a report is about without a reader. We have four for 5000 employees.

2. Reading technical reports requires making notes in margins and filling in missing steps--practically impossible with fiche.

3. Reading technical reports requires frequent cross-referencing

backwards and forwards through the pages--difficult with fiche.

4. Reading and understanding technical reports requires study at home, or any place you may be when you have some time available--impossible with fiche.

5. Hard copies are expensive from fiche.

I have several reports in fiche on my desk. I have scarcely even skimmed them, much less read them, in spite of my being fairly sure that somewhere in them is information I need. I might as well not have them, for the little good they've done.

I will admit that out situation with microfiche will improve a little, since we have just gotten a (one!) copier-reader. At least we can now get a hard copy on the spot. However, the expense and inconvenience complaints still hold. The information explosion is a problem I know, but there must be a better solution than microfiche.

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Our library provides practically unlimited reproductions of technical articles for retention by individual scientists, with anything listed in STAR quickly available in microfiche. Nevertheless, I spend $300 per year on personal subscriptions to the pertinent journals in my field, and use microfiche only for more obscure references. Then if I find an article really useful, I write the author for a reprint.

The problems are legibility, which ranges from medium poor for the text to impossible for any figure other than a line drawing, and the paper, which curls into a roll in about a week, if the reports are not pressed.

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My problems with microfiche are:

1. I do not have access to a conveniently located reader. (To me, a "conveniently located reader" is one which sits on my desk.)

2. I do not have a place to store microfiche. At present I use a

cardboard box. I need a special file. If the organization can't purchase documents or afford a reader, what are the chances of obtaining a new file?

3. It is necessary to justify having full size copy made from the microfiche. The result is a long wait.

4. I find microfiche hard to read and full-size copies made from microfiche of very poor quality.

5. My habits conflict with the system. I like to scan documents at home to identify those which require additional or careful reading. With microfiche I am tied to the reader.

The measure of an information system is its ability to supply timely and useful information to those who need it. Microfiche, which tends to limit the availability of information, seems to be a step backwards.

I believe the individual engineer or scientist's position can be summed up by a remark my colleague made while inspecting his first microfiche, "This looks like an interesting report--it's a shame I can't read it."

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I have recently had access to a hard copy abstract service which required using microfiche to examine source documents. In one instance I sallied forth from my office, microfiche in hand, overcame the following obstacles:

Finding the microfiche reader.

Placing it where it could be used.

Loading it to display the image correctly oriented.

Finding the first frame (backlash, focus, poor contrast).

and then found it was an image of a paper in the IEEE Proceedings.

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I am a computer mathematician in a Federal agency. We have one reader-printer (3M Filmac) serving about 200 people, who are located in three floors of a building and 10 trailers outside. I had been aware of what microfiche is for some time (two or three years, perhaps), but until stimulated by your letter, I had not made use of it. I had noted some interesting titles on the microfiche accession lists which are circulated in my office, but had not bothered to look them up. Probably the main reason is that, for some unknown reason, the microfiche is not handled in connection with the library, but instead by the administrative assistant. The reader and the file of microfiche are located in his office, not near the library or other places where people are likely to have business. The file is strictly by accession order, with no other indices. Furthermore, the accession lists as circulated do not have accession numbers on them. Therefore it was hard to find the documents I wanted. When I did find them, the reader was easy to use for viewing. Making hard copy was not so satisfactory. There is no attendant available to do this. I was fortunate enough to have a junior employee whom I could assign to do it, but many of my colleagues do not have such help. This would be a deterrent. Also, the quality of the hard copy is not nearly as satisfactory as Xerox, which is our standard method for other types of copying.

I do not feel inclined at present to accumulate any personal copies of microfiche, since the one reader is not that convenient to my office, and since I have no way of using it at home.

I was quite surprised to find, in my recent use of microfiche and in making a few related inquiries, that many persons in my building did not even know what microfiche is, even though they were acquainted with the use of our reader for looking at microfilm.

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I am involved with metallurgical research concerned with radiation damage. Microphotographs and electron microscopy comprise a substantial part of the reports I read. These microstructures, when reproduced from a microfiche, are illegible; thus, useless.

At XXX, I have found that reader-printers were being used to reproduce entire reports for personal files as too much time was required away from our offices to scan through a microfiche each time information was required. This consumed valuable time and paper.

Copies obtained from a microfiche were unwieldy, heavy, and tended to curl.

In short, use of microfiche reports are very inconvenient and of low quality. I avoid using microfiche reports whenever possible, and generally request full size reports.

Some of my correspondents who work in laboratories which have made a fetish (microfetish?) of microfiche treated me as an ombudsman by sending me copies of memoranda they had already written to their bosses about the decision to go the microfiche route.

For example:

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I have found from my use of library materials from RSIC that hard-back copies are much more acceptable for my purposes. The microfiche has the following disadvantages:

1. Requires too much time away from office to read documents.

2. Requires too much time to reproduce a full report.

3. Copies reproduced from microfiche are often unacceptable, hard to store for long periods of time, and leave an unpleasant odor for a long period of time on copies and hands.

I have come to disregard many technical reports for data utilization that are available only on microfiche.

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The system of microfiching documents is excellent for storage because of the small space required. However, for use by the scientist or engineer microfiche are useful only if the quantity of information needed is small. When dealing with complicated engineering problems it is frequently necessary for the engineer to have several documents handy for immediate reference (for derivations, equations, methods of approach, etc.). With microfiche copies this is not possible. It is infeasible for every engineer to have a reader on his desk, and even if this were possible, the frequent need to consult several references simultaneously renders microfiche copies impractical for the engineer. Thus, it is unrealistic to expect engineers and scientists to use microfiche as they would xeroxed documents.

It is obvious that anyone wishing to use microfiche without printed copies is more concerned with minimizing cost and minimizing storage problems than with advancing technology.

I believe that the necessity for printed copies of documents is obvious. Thus, printers must be used in conjunction with microfiche readers.

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While microfiche may be an excellent technology for the storage of information, it is obviously an extremely awkward method for the use of information. Not only is material difficult to scan, compare, or to refer to, but there does exist a shortage of "readers" which were not obtained with the present hiatus in view. The use of microfiche entirely will effectively result in much of the recently enjoyed information flow being curtailed; and it is a modus operandi which is mismatched to the coverage of technical activities now provided by services such as STAR. It simply takes so much more time to take the material to a reader and process it there - plus having to copy or commit to memory any useful material that may be found - all relative to full size copies, that user simply can not make the additional effort to maintain their usual (pre all microfiche period) cognizance of technical material. Information cognizance may be cut by a factor even greater than five

to ten depending on user. Budgetary limitations may require this - but do not let our administrators be deceived into thinking microfiche is a system equivalent in effectiveness and convenience to the availability of full sized copy. It is a hardship that may have to be endured but nevertheless a hardship.

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The current practice of NASA's technical information dissemination process of fulfilling technical report requests by supplying microfiche has succeeded in all but completely strangling the flow of technical information which is an important portion of the work in this office.

A borrowed portable microfiche reader has been used in this office for about five weeks, during which time I have come to the following conclusions:

The previous practice of issuing temporary copies of reports was far more effective for the following reasons:

(a) Scanning and reading of "soft" or "hard" copy reports can be performed rapidly and efficiently for long periods of time with minimal eye strain.

(b) While the microfiche reader may be an innovative technique in optical technology, it is of limited value because it is uncomfortable to use, its use precludes flexibility of relaxed reading; it is difficult and time consuming to scan reports, and it creates eye strain in less than optimum lighting conditions.

(c) When a microfiche report of high interest is identified, a hard copy must be ordered, in order to be able to transmit it to other members of the NASA staff, and the time consumed in this process is usually sufficient to negate the value of quick information transfer, by increasing the paperwork and unproductive time involved.

(d) On-the-job time is needed for microfiche reading, whereas with soft or hard copies, I was formerly able to scan or study,

as appropriate, reports of interest at my leisure, whether it be at lunch time, in brief slack periods during the work day at my desk, at home in evenings and on weekends, and most importantly, during otherwise "lost time" in transit on airplanes and in the evenings while performing official travel.

Thus, not only is the leisure time/travel time lost to me (and NASA) in reading reports, but also to even try to keep up with the situation, I lose up to a couple of hours a day in the office scanning microfiche copies of reports which, in full size copy, would take 1/3 of the time as with the reader. This time is generally scarce, with the result that I am reading an estimated 15% of my former document volume when full-size copies were available.

I therefore recommend that full consideration be given to returning to the former practice of supplying full-size copies of reports in response to our requests.

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Several days ago you called my attention to the problem of the large, unexpected demand for "hard copy" pages of microfiche reports, pointing out that over 2,000 pages had been requested for our Non-destructive Testing Laboratory in the past year. In light of the rather liberal distribution of microfiche readers in this Division, we were at first consideration inclined to agree that this usage of hard copy seemed unjustified. However, on looking into this matter, the Metals and Ceramics Division has come to the conclusion that the real problem is not the large volume of requests for hard copies, but that this is only a symptom of the real problem. The basic problem we find is that the microfiche system of information dissemination as presently constituted is inadequate to accomplish the job that it has been set up to do.

The microfiche is apparently excellent for storage of information and serves quite adequately where a quick scanning of a report for initial information is required; but, when it comes to the reading and studying of a report, it fails miserably for a great number of readers.

What we find really happening is that most of our people are either

neglecting the microfiche reports or are having copies made of the reports that they need. We also find that they have somehow been discouraged from getting a copy from the library or your photographic section and are resorting to a sort of "bootlegging" method of copying on a 3M "Reader/Printer" that we have in the Division. This copy is not only of inferior quality but, when the time required for the individual scientist, engineer, technician, or secretary who is badly needed for other work is considered, the cost of this inadequate copy is greater than the cost of the very good hard copy that can be supplied by XXX's group at a cost, we understand, of ten cents per page.

The Metals and Ceramics Division, after due consideration of this matter, urges a reconsideration of the problem of microfiche report dissemination and that serious consideration be given to making available a quick, economical service to provide hard copy of microfiche as needed.

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The impression I get is of people who want to read, but who resent the necessary (and unnecessary) barriers that the use of microfiche places between them and the text they want to read. People want to read what they want to read, when and where they want to read it, as rapidly as they are accustomed to reading. They miss the mnemonic aids of filing and of marking that they have been accustomed to. Any system that is to replace full-sized hard copy must be at least as convenient to use as full-sized hard copy. When it is not, you get letters like the following:

On reading rate

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With regard to my use of microfiche as a research manager I must say it is almost completely useless for the important task of report scanning. With a broad spectrum of materials research and development work being conducted under my direction, I have benefitted from the scan reading of hard copies and the margin note direction of operating

personnel via subsequent distribution of the report. I consider that specific facts gleaned in such a fashion strengthened my management control over internal programs and generate research concepts for proposal efforts. Unfortunately I do not see an easy mechanism for replacing that important function in a small organization operating on the forefront of a vogue materials field. The TAB, STAR and Nuclear Abstracts provide title and abbreviated abstract information for similar disposition. They and the new NASA SCAN service assure that I am aware of reports in areas of particular interest but they do not provide me with the overview that scan reading provided. More comprehensive abstracts might help but I do feel that this is a problem area which requires serious analysis. A microfiche cannot be scan read. A great deal of our technical progress is associated with the continued exploitation of the technical insight of our research management-level personnel. If the microfiche robs our technical community of that insight I feel certain that our technological progress will be slowed.

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My viewpoint may be stated simply: for the laboratory scientist, microfiche is essentially useless. Why? Because it is awkward, inconvenient, and a serious time-waster. When I want a report, I want to be able to pick it up promptly, bring it back to my office, and read it there. I haven't the patience to sit doodling with the controls on a microcard reader, trying to read something semi-illegible off a projection screen, and I haven't the assistants to take time off from more important duties to prepare a full-size copy. As a result, if the new report listings sent out by our technical library show that a report of interest is on microcard, I ignore it.

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Although I recognize the obvious cost advantages of microfiche as compared to hard copy, I firmly believe it is a step backward in the program to improve the dissemination of scientific and technical information. The average reader of a document of more than 10 or

15 pages rarely has time to read a complete report without interruption. I find that it normally takes me five to ten attempts to digest a 50 to 75 page report because of phone calls, more important duties, the "boss" wants to see me, etc. Nothing will take the place of hard copy for this type of individual, or for the person who takes reports home to read in the quiet atmosphere of his teenagers' blaring "hard-rock" stereo records.

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Microfiche readers are hard to get to:

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I find myself not reading microfiche reports. Here at S.L.A.C., we receive a bimonthly list of recently-received documents and the reports on microfiche can only be read at the library. Due to lack of time (and to personal laziness, I suspect), I have not read 99% of the microfiche reports since the library microfiche readers is about a ten-minute walk from my office and I find numerous excuses not to go to the library.

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At this plant, we have never been asked to order microfiche. When the question is brought up regarding microfiche and full-size copy, everybody wants the full-size hard copy.

The reader wants a report with which he can sit down comfortably at his desk, or take home, and study at his leisure; a report that he can refer to from time-to-time for reference, without going to some designated location where there is a microfiche reader, where he has to be uncomfortable in less familiar surroundings.

We have a microfiche reader here, but it sets around gathering dust, and I have never seen anyone use it. In fact, we had the reader for a year or so before the library was aware of its existence. And still everyone wants full-size hard copy.

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I will not argue that microfiche takes up less room, is easier to store, etc. In my office there are many reports, books and journal reprints, and a few microfiche. The reports, books and reprints are routinely consulted and are easily read. But, alas, the microfiche. I can't tell a student to go and get the red microfiche on the second shelf and I can't quickly determine what page 37 of a microfiche report says. Sure, I could buy a microfiche reader, but the only reason for buying the reader is because agencies like yours insist upon sending me microfiche. I have yet to meet anyone who would willingly ask for a microfiche report - they are too hard to read curled up in a chair, on an airplane, in the laboratory, or at my desk. A description of the last microfiche report I received is ample evidence of my disillusionment.

This report is a laboratory manual containing detailed procedures for the examination of blood, urine, etc. I read it in the library and threw it away. Can you picture a technician running to the library after every step in a new procedure. And I certainly am not going to buy a reader for the lab just for these few reports. Therefore, the material contained in that particular report is just as unavailable to me and many others, I'm sure, as if it had never been written.

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You can say that every university library has such reader printers, etc. However, these are very inconvenient. It requires that one move to a bull pen in some library where a large room is devoted to readers and to reader printers. It is not possible to have the material immediately at hand in writing or in studying. The investigator cannot have access exclusively to a reader printer because of the cost.

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You must have observed engineers and scientists at book work. Their desks are usually a mess, piled high with reports, etc., which are constantly being referenced, tables and data compared, extrapolating

lines drawn on the graphs, calculations made in the margins and on any other piece of paper that is handy.

Even if he is studying a single document he typically has his fingers stuck into the pages at several points because some idiot author put all his data in the appendix instead of adjacent to the discussion in the test. Obviously, he cannot use a microfiche reader. He's got to have a reader printer. Typically there is one of those devices (they cost more than a mere reader!) carefully guarded in the library to which the user (whose time exclusive of capital facilities used is worth 20 to 40 dollars per hour to his employer) must go to make his own copies (the librarian does not have the time to perform that service), even though his office may be twenty miles away!

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And not worth much when you get there:

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I work at the XXX Laboratory, Schenectady. We use microfiche extensively, and we have many readers. The people charged with filing documents are very happy with it, but those of us who have to use it detest it. It is certain that many potentially useful reports go unread because they are not available on hard copy. Some of the reasons are:

The viewers all have vertical screens, with the center about opposite your nose. This requires an unnatural reading position, which can be quite tiring. For those of us who wear bifocals the head must be tilted back to the stiff-neck position.

There are a few minor annoyances, such as the fact that there are several models of viewer and the operation of each must be relearned with each use; when the left side of the screen is in focus the right side isn't.

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I feel strongly that a potentially useful communication medium is being penalized by a basic engineering problem, the development of a flexible reading device that is sufficiently inexpensive and compact that it can be readily available when needed.

I have tried the microfiche system with primitive readers and have been frustrated by purely mechanical deficiencies of the equipment. More flexible devices are generally less available and still not completely adequate. Until I can "page through" microfiche copy concentrating on the content instead of the film orientation, the focus control, and the positioning knobs my microfiche accession list goes into the wastebasket.

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We find the system almost useless because of (1) the time and bother to get to a reader, (2) the difficulty of getting an enlarged copy to ponder over at length and (3) the occasional jam-up at the one reader remotely available.

The economy in reproduction costs is more than offset by the overbalancing lack of economy in loss of time and reduced study efficiency at the users end. It is very false economy!

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It is true that the microfiche form is useful for storage. However, in order to use it one must have an appropriate reader. These are not inexpensive and some of us find them very difficult to use. I find that after about 20 minutes my eyes just cannot stand the strain. Moreover, if one is to have maximum use of these small copies it is essential to have a reader printer. In many instances one needs to refer regularly to a table or something of that sort. Consequently it is necessary to have a full sized print.

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The technical man needs most to learn how to work without hard copy or to find a way of getting somewhat less expensive excerpts of critical portions in a convenient form. The reader-printer we presently use does not give an 8-1/2" x 11" page, the paper is much too heavy for convenient storage and 11¢ a page seems unreasonable. Because of report formats with AD numbers on one page, title and author on a second, abstract on a third and bibliography at the end, it takes a minimum of five pages just to get a simple reference document.

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Existing readers are totally inadequate. They are difficult to keep focused. The top half is focused, the bottom half is blurred. Light from overhead is reflected in screen and washes out image. This results in frustration and eye strain.

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The library at the laboratory where I work is, like others, being dragged unwillingly into the use of microfiche. I object!

Microfiche is an information burial system. From where I sit, it looks as if those who are pushing it want to make it as difficult as possible to disinter it. They may not mean it this way, but this is the result. Microfilm is bad enough. The only thing I know of that is worse than microfiche is microcard, and that will probably be next after everyone has had to buy these horrible microfiche readers.

It is theoretically possible to make microfiche usable, but it seems that no one is really interested. Many of those that I have received are so badly out of focus that no optical system could restore readability, no matter how good the lenses. And the readers we have here are so bad that even a perfect microfiche is very very difficult to get any sense from. The combination is sad indeed.

A microfiche is in front of me now. I need the material on it. To get it in a form I can use and preserve my sanity, I will first make a print on the reader-printer. That copy is so flimsy and curly that it will be necessary to Xerox it to end up with something usable. This is progress?

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Your request for strong opinions on microfiche, as printed in Research/Development, is appreciated, since an individual seldom has a chance to speak out against the general or total system. This letter is intended as one from a research scientist, who still tries to keep up with some of the literature.

The Technical Information Division of this Laboratory distributes a weekly listing of reports as received in full size hard copy, and a similar listing for those received as microfiche. The hard copy is sent on loan (24 hrs) and I can read it, study the graphs, and scan the references as they are referred to in the text. I can make a Xerox copy of that page or that graph if necessary, and I can then obtain data from the graph, interpolate, or compare my own results directly.

A personal copy of any microfiche is supplied on request, but then's when the fun begins. Page one of the text refers to reference 1, which is at the bottom or on a second film if the article is more than about 40 pages, including figures, and the author always asks, about page 10, that you compare, the date of Figs. 2 and 7 with the sample designation as indicated in Table III. The Microcard reader seems to have different focus for page or figure, and the N-S or E-W slide always seems to bind when you try to jump from frame to frame. You cannot extrapolate from the graphs, and you cannot compare your own results. The final blow is that they often microfiche a foreign pre-print or reprint, with 8" x 14" figures such that you read the text sitting down, but must lie down or turn the machine on its side to study the figures.

I'm certain that many scientists order the microfiche, decide if its of interest, and order a hard copy, at considerable expense and time delay; but I'm also certain that many other scientists just take a chance,

and disregard that portion of the literature that can only be read by microfiche. The Federal agencies can claim an economic advantage by increasing the percentage of microfiche, but they can't prove it. How many scientists, for example, repeated an already existing experiment, and published it again on microfiche. We may end up with a situation wherein everyone does what he wants in the lab, since nobody ever reads the results.

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Pictures create special problems.

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As a metallurgist, a substantial part of my work involves reviewing papers containing photomicrographs. Because microfiches are negatives, the photomicrographs are difficult to interpret. The quality of the printed positive is usually not suitable for my work, either.

And you can't read where you want to and when you want to.

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Almost every available moment can be used in reviewing documents if in a hard copy form, but this is not true of the film. As an example, if someone is planning on visiting you, then you can possibly use the waiting period reviewing a hard copy of a report at your desk. This would not be possible if you had to use a film reader located down the hall from your office.

You can't mark pages.

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I am strongly opposed to the use of microfiche copies of technical reports since they do not allow the use of such reports in the following ways which I find absolutely essential: (1) make notes in the margins for future reference; (2) underline key phrases and equations; (3) make copies of individual pages, charts, and illustrations for separate use;

and (4) read the report at odd times or in odd places away from viewing machines (e.g. on airplanes or at home). Noting that storage space considerations make microfiche attractive, I still would prefer to retain the hard copy which I have read and personally marked; since my notes are important to my future use of the report.

Thus, I consider the use of microfiche reports not only impractical but an obstacle to technical progres. The fact that I have seen printed material from the library of the company at which I am employed which advocates the use of microfiche in place of standard hard copies of technical reports indicates that someone has forgotten to consider the requirements of the users of such reports.

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For the usual 50 page graphs-and-equations-oriented research report, I would urge the retention of the thoroughly human-engineered, well-thumbed, marked-up recognizable-by-color hard copy printed paper document.

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Nor flip them.

It is impossible to jump around in the report. A Figure, or a Reference, or a Table may even be on a different fiche. Even when it is on the same fiche there is difficulty (and lost time) returning to the original spot in the text. It is frustrating trying to understand a long mathematical equation when the list of symbols is at the end of the report.

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Original reports should have curves following text so constant screening of pages is not required to switch from the text at the front of the report to curves and tables at the rear.

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Our library is more and more using microfiche for the obvious advantages of cost and size. I would comment that other technical people and I find it of far less value than the full-sized reports. In the course of a very busy day, I find it difficult to get to the library to read microfiche or microfilm. I can have the full-sized reports delivered to my office and normally read them at home. It would be inconvenient to carry a reader home for microfiche and it would be expensive to supply our technical staff with individual readers.

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But probably the main drawback is that microfiche denies the individual scientist/engineer his freedom of choosing when and how much he will read, by making necessary a mechano-optical link between the printed page and the good old, otherwise reliable, Mark I Eyeball System. In short, the flexibility in reading is gone. I used to fit the reading and scanning of reports into small niches in my schedule: At home in the evenings and on weekends, between appointments at work, on the bus, on airplane trips, in motels while on TDY, during lunch hour, etc. This is not to say that all of my reading/scanning was done during these times, or that all of my "spare" time was occupied with reading reports; but, now that I am shackled to these irritating bits of nitrocellulose film, I find that I just am unable to read anywhere near the volume I used to - even with speed reading!

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Is it worth the trouble?

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The economic advantages of microfiche are, as you state, obvious to the issuing agencies and the GAO. Largely this is because in their queer economics they have neglected to include the dollars (which have yet to be made available) required to equip the users with adequate devices to read and reproduce the microfiche.

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The only gross accrual benefit resulting from the shift to microfiche

reports is the conservation of filing space for the reports only. In balance, this benefit disappears when the problem of storing and accounting for abstracts of microfiche reports obtained by "brute-force" has to be solved.

I wonder whether the benefits from "differential pricing" is a cost-effective trade off for the salaried time of scientists and engineers queueing for readers, reader-printers or for manually abstracting from microfiche reports?

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No doubt the use of film is the least expensive method, of the two methods discussed, of getting the information to the user. But considering the cost of the engineering manhours to projects to locate film readers and make hard copies at the location of the engineer, it is doubtful if there is any savings at all. It may be even more expensive for the government in the long run.

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The user opinion is that the net gains realized in not making hard copies available are more than lost in the added time it takes an engineer or scientist to digest the desired information through a reader.

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The microfiche today is causing many engineers to ignore good data and in some cases, to perform engineering work that has already been performed.

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I'm certain that you've heard nothing but wonderful comments about the microfiche system but in my opinion, its use has created a whole new spectrum of problems. To partially illustrate what I mean, I

should reduce this letter when I'm finished to microfiche and let you go thru the problem of finding and using a reader when you get it. But that isn't really all the problem.

What has been done is to reduce the problem of dissemination and increase the problem of comprehension. The net gain on the overall system of information data has been negligible. You have shifted a whole new set of problems to the user of these documents.

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Microfiche is a wonderful system of information storage. It allows the librarian for the first time to keep his product well protected and not handled by those horrible people who read books. If I sound bitter I am. Never have I seen a system, supposedly to be used by people, designed so poorly nor with such disregard for human engineering principles.

Let me illustrate:

1. The advantage of the printed page is that it allows instant access to information for anyone able to read. Not so with microfiche, a reader is necessary.

2. Printed matter is easily referred to on a page comparison basis. The modern trend to all figures at the end of a report makes it almost impossible to use microfiche for any serious work.

3. Gutenberg discovered the way to mass produce printed matter and as a result we now have a low cost system of printing. Microfiche makes every user his own printer since to be useable one must reproduce the article or report in legible form.

4. Reproduction of microfiche by individuals is very difficult and expensive. No system was available for several years after its introduction for doing so. Even today Xerox systems are not too good.

In closing I would like to point out that this whole system has all the characteristics of another poorly conceived and badly executed governmental attempt at the millennium.

In a group of about thirty five senior scientists I can find not a single one who finds the system useful. Either time is wasted waiting for a full sized reproduction or the information sought is dispensed with.

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And,

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The first point to consider is the purpose of the mountain of technical literature being produced in this country.

Is the primary goal to create dimensionally small archives wherein all this information is to be neatly stored for obsolescence in government centers and large libraries or, - is the intent of the writers and scientific centers to be dominant for quick and easy information transfer to the technical user of desperately needed information in his field of activity, unencumbered by all kinds of needs for optical readers, microfilm and microfiche hard copy producing machines.

I would think the name of the game is information dissemination not information storage. The last person or organization that should be asked about the form material should be made available in to the investigator is the person responsible for storage (library), the shipper (U.S. mails), or the preparer (printer). The first person one asks is the last link in the chain (the researcher and reader). It is for him that the money was spent in creating the information so why not make it easy for him.

A technically oriented organization must study much literature and when sent as "negatives" (microfilm, microfiche, operative card, etc) immediate problem situations are created at the end of the line. A line forms in front of the one or two optical readers located in darkened rooms and the process of getting on with the job is slowed down to a crawl. The readers are generally broken or misaligned and taking notes next to them is an extremely tiring process that has no real reason for existence. I defy anyone to get a printed piece of 8 1/2" x 10" hard copy out of adjustment and it can be read in the subway, on the bus, or at home, where many busy people take some

of their reading. It isn't even beyond reason to think that it would be much more efficient for the researcher to be able to read and think about his material at this desk. The utmost in utility is for the information to be at the desk of the person needing it, for direct consideration in what he is doing at the moment, or in his file, and in a form requiring no other aids.

Specifically, I am reviewing the field of Oceanography for my company. My microfiche is sitting here unread, the hard copy is reviewed as soon as the mail boy drops the info on my desk. I would almost be better off to "burn" the negatives so they will no longer worry me about containing the exact information I am looking for. I have gotten costs for reproduction up to 25¢ a page and that is too much of a burden for any company that has people like myself reviewing thousands of pages a month. We have no film readers and hard copiers are slow and quite expensive. What is effectively happening is that the microfiche the government supplies containing information on research and experiments they have spent hundreds of thousands to millions of dollars on it not being examined. A person takes the path of least resistance. If I have two piles, one hard copy, 8 1/2" x 10", the other microfiche, I go thru the hard copy first even should I be lucky enough to have my own personal reader sitting on a table in my office. Should the hard copy pile be very large, then I will never get to the microfiche. What if magazines came in microfiche?

CHAPTER IX

FICHE, QUALITY AND FORMAT

The quality of the microfiche reproductions is uniformly high. Of course illustrations suffer in both hard copy and microfiche because the high contrast necessary for the printing is unsuitable for half tones, and this is catastrophic in the case of some reports which depend entirely on illustrations for communication.

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The reproduction of photographs in microfiche is still a problem. First there is the difficulty of viewing a negative and mentally translating it into a positive; secondly, there is the excessive contrast introduced by the microfiche reproduction materials and processes that wash out quite a lot of detail. The absence of color makes graphs and color pictures almost as hard to read as in black and white HC reproductions made by the Xerox process.

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A third phase is the desirability of having the microfiche (particularly from phase two above) in positive image format. Even better would be a color positive image! It would also be desirable to have CFSTI microfiche available as positives so those users who do not plan to make photo printouts can view illustrations in their proper tonal relationship.

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In servicing information requests we in the information center do use the film ourselves and I personally do not find it objectionable--excepting instances of poor quality film usually resulting from poor original material. One noticeable difficulty exists when large material (graphs, tables, etc.) are reduced in the original they tend to be essentially impossible to read at a standard reduction of even 19:1. One can correct such problems only when one uses the planetary camera and adjusts the reduction ratio for such items; on microfiche it would seem likely to be quite difficult.

The usefulness of fiche copies is VERY GREATLY HAMPERED by poor photography - I have fiche copies of Atmospheric Transmission tables that are useless because the tables themselves are illegible. Pages are often found out of focus to such an extent that they can not be read. This seems to be the greatest objection to fiche - the poor photography.

The DDC standard form (16 mm film, x 19 reduction) does seem to be adequate for reports of typewritten pages, such as are used for Technical Reports. However, when used for journal articles, the legibility of super- and subscripts occasionally is poor, making such method of document storage not useful for purposes of data evaluation. Initially we have attempted to keep a uniform file, all on 16 mm fiche or jacketed film (all on 4 x 6 fiche). We are currently considering a change to 35 mm film as we have experienced too many cases where the 16 mm microfiche, as produced within the Bureau with regular microfilming equipment, is not satisfactory. This is particularly true for the older literature, where type setting occasionally is small and the journal pages not of top quality. At the present, we are also running some tests in an attempt to improve photographic procedures. However, at the Alloy Data Center we hope to spend our time producing data compilations and evaluations from the literature using fiche as a "convenience", rather than becoming involved in the details of their production. The simplest solution for it is then using a smaller reduction ratio. We have looked for the availability of existing microfiche services outside the Bureau, and for a short time were able to make use of a library service located in Delft, the Netherlands. However, the service was discontinued as the amount of fiche we need is far in excess of the capability of this library, which is part of the Institute of Technology and consequently was meant to serve the faculty of that institution only. At this time we have no other source of microfiche than those produced from journals obtained by our library and microfilmed at the Special Services Section at the NBS. Although we would like to use microfiche only for incoming documents, at this time we cannot do this as the quality as well as the time needed for their production are prohibitive

There are other data centers at the Bureau employing microfiche as well. These also rely on internal services for their production. We

would like to suggest that at this time it may be advantageous to many research programs in many disciplines to have a central Microfiche Service, located at a large library (Library of Congress) from which microfiche would be available at a reasonable price (we paid approximately 28¢ per fiche for those obtained from Delft, when their service was still available to us).

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Here are some of my impressions of the use of microfiche here. We all like to save money on our budgets by getting the microfiche copies. We are less enthusiastic about (a) misfiled microfiches, (b) poor camera work on the microfiches, i.e. resolution is definitely borderline or worse than GSA requirements, (c) reader-printers that are not designed for use with microfiches, and (d) fingerprints, splotches, daubs, and mildew--all of which seem to accumulate on our microfiches, but which never seems to happen to anybody else. (These annoyances are pretty much in order of significance to us.)

Misfiling of microfiches, of course, is not your problem. It exists none the less and should be recognized as an inherent difficulty with the medium. Cartridge microfilm does not demand this sort of care on the part of the file clerk.

Incompetent, out-of-focus reproductions just should not be tolerated. The specifications for federal government microfilming must be tightened up, and quality control vigorously enforced. One bad microfiche will give the whole medium a bad name, and we have had many bad ones.

I am sorry a 4x6 size was chosen as standard. It seems as though the 8x5 would have been much more suitable for available storage equipment.

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While I like microfiche copies if they are in 4x6 size, occasional larger sizes from NASA or 3x5 'fiches from some commercial

sources foul up my filing system. A real pain in the neck are intermixed rolls of 16- and 35--mm microfilms on which older AD or ATI documents are reproduced, not only with regard to filing and retrieval, but also for reading because of nonuniform quality and since not all machines accept rolls and special attachments must be installed on others.

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When RSIC (DDC) first introduced the fiche concept, we were led to believe that everything not a hard copy would be on sheet film- this has not been the case. Five members of this branch alone have rolls of 35 mm film that is utterly useless-no readers are available, except at the library. The orientation of the pages on the film + the lack of any side perforations render use of the film in a regular 35 mm filmstrip projector impossible. (we tried).

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Some of the typists producing the headings for microfiche seem to take delight in making the headings as useless as possible. A couple of examples are attached, with handwritten additions on the jackets shown. Judicious use of abbreviations, acronyms, and space-saving letter arrangements could give all the needed information without wasting space.

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With regard to the fiche received from DDC for AD reports, the bibliographic citation does not indicate neither in the TAB Index nor on the fiche proper if the same item prior to its becoming an AD report, had been published in a journal. Only after having prepared a hard copy from the fiche does this become evident. In the NIMH Clearinghouse we have about one thousand journals in the system which are being regularly abstracted and indexed. Obviously we do not want to process the same item twice.

I am sure that other organizations receiving microfiche regularly from DDC have encountered the same problem. Do you think that COSATI could be instrumental in suggesting a solution whereby this "duplication" could be noticed prior to ordering the microfiche?

The format of reports should recognize the increasing use of microfiche. Placing tables or figures at the end of a report may be acceptable in "hard copy", but is is at least frustrating on microfiche, particularly for long reports which extend beyond a single microfiche. For microfiche I think that figures and tables should appear as close to the discussion text as possible, and that the reference to figure or table numbers should be accompanied by a page designation as well.

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As for report organization, defense agencies have a significant job to do. When the illustration on page 24 is discussed on page 17; when a citation to number 12 in the bibliography sends one to page 124; when the organization and contents of a chapter are found only by locating the Table of Contents beginning on page iv; when the colorphoto illustrations are meaningless blurs in black and white; when the labels on a graph read like engraving on a wedding band, the willing microfiche user is in trouble and tends to revolt. These are technical and procedural difficulties, but only temporary objections. The requirements for manuscript submitted to GPO answer some of these problems, and a new look at the instructions governing preparation of technical reports can do much to produce a practical microfiche master more acceptable to the user.

CHAPTER X

MICROFICHE READERS AND READER PRINTERS
WHAT'S WRONG WITH TODAY'S MACHINES

I am not satisfied with the quality, etc. of the microfiche readers, etc. available on the market. The librarian and user are at the mercy of super salesmen and each machine has to be carefully analyzed. Analyzing surveys or comparison charts does not give the user an accurate evaluation. One still must see and handle the machine. We are also being subjected to super salesmanship regarding various microfilm systems which sound and look good, but are not cost savers, at least, initially.

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Viewing Angle

I recently ordered several microfiche in lieu of the hard copy reports I normally request from DDC. I located a reader in another office in the building (Pentagon) and after brief instruction tried to read the reports.

I wear bifocal glasses. This means I had to tilt my head back to an abnormal position in order to look at the viewer. After 10 to 12 minutes of this I gave up in disgust and spent the rest of the day with a "pain in the neck." Result - I read a portion of one of the reports I ordered and "disposed" of the others in file 13. Unless readers can project the image at normal desk level and at a horizontal or close to horizontal position, they can't be used by people with bifocal glasses.

I also found that I couldn't read the charts, tables or graphs in the report that were printed at 90^{o} to the normal printed text unless I lay down on the table in a position 90^{o} to the normal viewing position. All reader instruments should have the capability of rotating 90^{o} to permit convenient viewing of charts, tables, etc..

I found that I had to re-focus the viewer many times in my attempt to read the report. I didn't make a detailed investigation of the reason for this.

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One criticism is that a film or fiche cannot be read as quickly or as comfortably as the printed report. This is true for me since I wear bifocals. My head must be held at an uncomfortable angle in order to read what is on the viewing screen. If the film or fiche is more than 20 or 25 pages long the discomfort can cause stress.

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The present microfiche system is not suited for the reading of technical reports. One is accustomed to reading documents flat on a desk or leaning back in a swivel chair. One can easily flip to the references, to the contents, and to the figures. It is quite annoying to shift the microfiche carrier around to find the references or a figure and to shift back. It is quite annoying to get a stiff neck sitting in front of the near-vertical screen.

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However, most users report that prolonged reading is more tiring than reading from a hard copy, probably because of the angle relative to the eye at which the material is presented and the lack of pure black and white contrast. Perhaps more intensive human engineering research should be devoted to readers.

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The Chairman of our Library committee is an enthusiastic supporter of microfiche, but on the other hand we do have some individuals - many using bifocal or trifocal glasses, who do not like microfiche or microfilm at all and complain of the difficulty in reading it.

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The usual disappointment in the information content of many contractual reports was compounded by the need to sit in an uncomfortable position while reading them. Rumor had it that Management

was attempting to discourage the use of microfiche entirely.

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NOTE: As a member of the trifocal group, I find it tedious to sustain head position in front of the reader-printer. Our Librarian plans to improve on this by providing a piano stool for ready adjustment.

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Optical Quality

The microfiche readers themselves are judged to be adequate by 16 to 3 when the user is asked the blunt question, "adequate or not." However, the answer was often qualified by a "but"---

5 respondents disturbed by screen glare.

6 respondents reported focusing problems (focus across entire fiche, a carrier alignment problem).

3 respondents complained of microfiche quality.

2 respondents were disturbed by inability to rotate graphs and charts on the screen.

2 respondents mentioned a fatigue factor in reading from machines.

1 respondent considered any reading devise a "pain in the neck."

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My reaction in attempting to evaluate the equipment and the microfiche standards might best be described as one of discouragement

and frustration as a "consumer" of the equipment and the information on the microfiches. This results from the rather non-scientific "sell type" or "user" oriented information which appears in almost every brochure or magazine article I have seen on the subject. In short, "let the buyer beware" I have found to apply in the field of microfilm as in any other field unfortunately in the consumer fields in this country.

It is my conclusion that the microfiche reader manufacturers (including but not limited to the Atlantic Model F-66 which I have been attempting to use) are misleading the consumers by not informing the consumers in the technical sales brochures that:

1. Microfiches can be expected to vary in the reduction ratio due to the technical necessity of having to vary the ratio to accommodate the large variation in original document size.

2. Microfiches made to COSATI or NMA standards can thus also be expected to vary in the reduction ratio.

3. Due to the necessity of varying the reduction ratio because the original documents are not specifically designed to be of uniform size for microfiche, several lenses of various magnifications will be needed to permit the consumer to cope with the apparent "non standardized" situation.

4. Sales brochures should include a table giving the lens magnification which should be used for a given reduction ratio.

5. The sales brochure and the instruction manual for the micfofiche reader should include a brief description of how to determine the reduction factor using the "National Bureau of Standards Microcopy Resolution Test Chart 1963" which appears at the beginning and end of every microfilm roll or microfiche.

6. The sales brochure should include a little more descriptive information about the quality of the lens and how the magnification and resolution can be checked by again using the "NBS Microcopy Resolution Test Chart 1963".

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Microfiche is poor for information retrieval. A large, expensive and delicate reader is required to read it; an additional stage of enlargement and reproduction is required to provide "hard copy" which the individual engineer can use at his convenience. Definition of the viewers is so low that, combined with the negative format of the usual ASTIA microfiche, the content is only marginally readable. Hard copy is slightly better, but still is worse than the old ASTIA Xerox copies of microfilm, and costs more.

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As far as general usage of reports is concerned, the efficiency of microfiche as a communications medium suffers from: lack of legibility (periodically), constant fussing with focus, irritating light reflections from the viewing screens, impossibility of making marginal notes, underlines, corrections, additions, etc., impracticality of using a scale or dividers to accurately interpolate on graphs, impracticality of using any aids to bring the eye into register on the page, inability to scan the abstract or contents quickly without resorting to a reader, and impossibility of use outside one's home base (particularly on trips or at meetings).

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With the small portable fiche readers available, there is no way to take a graph from a report and interpolate points not actually plotted, as can be done in a hard copy.

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The only serious objection to reading microform that I can offer, is the physical discomfort produced occasionally by eye strain and a tendency toward motion sickness caused by movement of the images across the screen during search.

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At a demonstration of Recordak machines in a van outside our building just one hour ago, a scientist summed up his opinion quite succinctly. He said that if one's objective were to scan the material to evaluate its pertinence or value to one's work, microfiche is fine. If in the report there happened to be a few pages of charts, graphs or equations that one might need, then, if a reader-printer were available to copy off the desired information, microfiche is acceptable. If the document were highly pertinent and needed for thorough study, one might as well buy the hard copy and forget about it, since two hours before the best illuminated screen on any film-print-reader is worse than 10 hours of watching TV so far as he is concerned. Furthermore, one cannot mark up, change or quarrel with the text!

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Our staff members vastly prefer to use the original hard copy, or even a photocopy, rather than microfiche. This preference is based primarily upon visual strain, which while not serious is still bothersome. In some models the noise of the air blower cooling the lamp is of a noticeable level and is somewhat distracting to the reader and to others nearby. Many microfiche readers do not have light shields and sufficient contrast is not available unless the overhead lights are turned off. These features may impose a requirement for a special viewing area.

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At a company where I was employed until recently, I found the microfiche reader or viewer was inadequate. On a several sheet document, the bottom line was not readable. This meant missing about 12 pages in the middle of a report, or per page of fiche.

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Page Flipping and Marking

We have a number of manuals which we frequently use in our design

area. These include Drafting Room Manuals, Engineering Design Handbooks, Personnel Policy Manuals and a variety of others. Recently, we have been encouraged to switch to a microfiche viewing system because of cost and space saving. I find that the system is excellent for a quick look at a specific subject, occupying say one page. However, it loses its efficiency when you have to flip back and forward from page to page, as is usually the case when you use a Drafting Room Manual. One centrally-located viewer would be sufficient for occasional looks at most manuals, but designers would require individual viewers for use with Drafting Room Manuals.

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Some users have mentioned that with microfiche it is not easy to look ahead or back a few pages. If a document has a long list of symbols or other nomenclature on a foldout sheet it may be easily referred to without turning any pages, but this feature is lost if the contents are placed on microfiche. Finally, it may be mentioned that marginal notes or comments cannot be made on a microfiche or film, but can be made on the original or a copy.

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If you know of a reader-printer for microfiches that does not require jerking around to get the particular frame you are looking for, please let me know. Microcards have such readers, why cannot microfiche readers do the same...

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The following comments are offered in response to your survey of microfiche users. The greatest disadvantage in the use of microfiche is, in my opinion, the inability to "mark up" a report with comments, corrections, and/or supplementary details. It is usually advantageous and sometimes necessary to annotate a report as it is being read, and the only way to do this conveniently and efficiently is with a hard copy. Furthermore, the value of such annotations to future readers is lost with microfiche.

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On Reader-Printers

We are a small company and not a library and can not justify a hard copier with an operator. We have looked at several copiers and find that two general classes exists. The chemical types and electrostatic. The chemical types are in some instances cheaper but are slow. Only Xerox has a high speed future capability but has to be ordered for "positive" or "negative", it can't do both. The chemical units can do both. All the machines require manual positioning of the frame and viewing in a viewer for focus and position before a "print" is made. In this day and age and the complexity of the machines a minimum requirement should be automatic microfich positioning for copying the pages present per negative. The chemical systems when in occasional use soon become messed up and a person assigned to take care of the unit eventually becomes anti-chemical and anti-cleanup in regard to the machines. The researcher fools with the machine a bit and it is soon useless waiting for a repair man to come in. This is what I have experienced in other places.

To Summarize

I have a microfiche reader on the table next to my desk, so I don't have to go anywhere to use it. The microfiche themselves are stored in a tray next to the reader. So from the standpoint of accessability, the material is just as close as it would be if it were shelved hard copy. The problems, of course, readability and convenience. To start with, a screen showing dark grey letters on a light grey background is less than desirable. The illumination is not uniform over the screen, making it necessary to move my head in order to read an entire page, instead of moving the page, as I am accustomed to doing with a book. When a drawing or table is sidewise on a page, I have to crane my neck to read it, since I can't tilt the page. When I'm referred to an appendix, or to a graph on another page, or to a footnote at the end of a chapter, I can't just flip there while holding my place with my forefinger. It's a major job finding the page to which I've been referred, then another major job finding where I was again. And if the page to which I've been referred is on another microfiche, that multiplies the problems.

The Customers Would Like:

My personal opinion is that one cannot consider microfiche without also considering readers and reader printers. Presently available readers seem to be at the same state of development as dictating equipment when it used a wax cylinder and cumbersome voice tube. As you know, dictating equipment has now reached the state where the equipment may be held in the hand and operated with ease. This evolution of course was brought about through the advance of technology. Unfortunately, technology does not appear to be a primary factor in the evolution of microfiche readers since presently available technology is not being fully utilized. The problem seems to be one of economics. That is, the development of more compact or inexpensive and more convenient viewers will not come about until there is a larger market. The larger market on the other hand, namely greater use and acceptance of microfiche, will not be realized until the readers are more user oriented. Some catalytic force will ultimately be necessary to move the field from dead center.

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This lack of reasonably priced readers and views have stymied my interest. Using photographic equipment as a point of reference, I believe that the government is being fleeced by distributers of viewing equipment. Here is a medium that can have as great as impact on the publishing field as did the long play record did in the audio field. Back in 1943, there were $30 players to create interest among the public. Such is lacking today in microfiche. Moreover the current vendors show little interest in creating a mass market. If government continues to switch towards film, I believe it is obligated to make available an inexpensive viewer to the public.

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Portability

Economic pressures will force us to obtain our own reader. In fact, we have delayed only to find the least objectionable one. However,

even that will not solve one of our key problems. Most of us take a report home at night or over the week-end. This now demands a personal inexpensive reader for each employee. Any of the lighter and smaller models I have seen do not lend themselves to an extensive reading session.

So far, I personally believe the disadvantages of microfiche outweigh the advantages. To change my mind requires inexpensive readers that would allow me to read continuously for several hours without eye strain, either at the office or at home. In fact, even more desirable would be a unit I could carry in my briefcase so I could use the five hours on the airplane between here and Washington.

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We have tried two brands of vest-pocket type readers for rapid scanning. Neither is considered satisfactory. In my opinion it would be beneficial in an environment such as ours if we had a good little inexpensive reader that each scientist and engineer could use at his desk.

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Most patrons will use microfiche, the chief complaint being lack of convenience. A research scientist will often wish to compare data, tables, etc. and finds himself frustrated having no convenient reader in his laboratory or office. It would seem that development of a convenient, inexpensive portable reader with a good quality image would be acceptable. This would permit easy access to use of fiche in areas convenient to the patron rather than a central location.

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For all the reasons which caused you to invent your "Cuddly Little MF Reader", I plead that it be manufactured - every time I get a chance! - to Bell & Howell, to Atlantic, to big time librarians. 'Makes one feel like a nit picking on their leg. There is too much that is psychologically offensive in more & more fancy, shared machines.'

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Cheaper and Better Reader Printers

We do not now have facilities for reproducing fiche locally, but I hope that we will obtain such equipment in the near future. We find that reasonably good microfiche readers are available, but in my opinion, there is not yet available any really satisfactory reader-printer; the cost per page for the least expensive is still 10¢ which I feel is too high.

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Continue search, and pressure on possible suppliers, for an acceptable hard-copy from microfiche production system. The criteria here are: high speed, cheap copy cost, and copy on ordinary paper. (An interim measure is the Xerox adaptation to microfiche enlargement at the 914 duplication; this, though slow, and relatively expensive -- but cheaper than present 3-M system -- is being considered for procurement.)

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For purposes where note taking is not sufficient, the patron and the librarian both would like a convenient, easily useable reader-printer. My personal desire would be an electrostatic process printer which would give positive copy, one which can be easily operated by anyone without having to check fluids and other problems associated with printers not in regular daily use.

We need reader-printers that are automatic, i.e., that will make hard copy of entire fiche or of certain page runs within a fiche, automatically and without "button pushing and crank turning."

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I would like to see a reader printer that would at least let me put together my own page of several important paragraphs, a title and

AD numbers so I could have a simple hard copy for reference. Now I must copy all these pages and cut them up and go to Xerox. The copy generally gives poor Xerox copies, so one is not satisfied that it is all worthwhile.

A do-it-yourself camera

I feel that there is one essential ingredient lacking in the present microfiche picture. That is the availability at reasonable cost of a camera for direct production of microfiche copies from original documents. Until this step is possible -- adding one's own material to the microfile -- the usefulness of any form of microreproduction will be marginal for me.

Until the emphasis on microfi developed a year or two ago, I had been seriously considering the se of 16-millimeter microfilm for systematic filing of my personal technical material. This seemed possible because the Kodak Lodestar microfilm reader with cartridge loading and rapid mechanical transport for locating individual references was available at moderate cost, and a wide variety of cameras, film, and processing service could be obtained. A microfiche system, however, would be even better because the reading devices are simpler and cheaper, manufacturing and processing the film is simpler and cheaper, and the separable file units for sorting and retrieval are a more convenient size. I see no reason why a camera with a simple step-and-repeat mechanism cannot be made as a companion to the moderately priced viewers now on the market, and in the same price range.

For my own use, a reader costing as much as $100-200 would be a reasonable investment on my part if I decided to adopt the microfiche system. The central availability of a camera near my office and in the library, as machines for making hard copies are now available, would serve my needs in using microfiche; but I would not adopt such a system unless other less expensive cameras were on the market, which I could purchase for my own use if necessary.

And a proper reader

So far as microreaders are concerned, the reader should suit the

requirements. There are so many makes with so many prices and capabilities. I have never seen a microreader that has not been criticized by some library user. I would suggest a group of qualified AF personnel study and select at least five readers as best suited for AF purposes so far as convenience of use, durability, quality of reproduction, price, and adaptability for special purposes. This would greatly assist in eliminating the "dark morass" of the confusion of acquiring readers for varied AF purposes and soften the criticism directed at librarians and STINFO officers for choice of readers.

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Automatic image sequencing and rapid frame-locator systems are needed to get the user's mind off machine manipulation and back on the document content.

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An improved machine would have first-class optics and a dark screen, and use white-on-dark format fiche for improved contrast. (Just imagine trying to track dark "blips" on a bright radar screen.) Page advance should be automatic push button, with automatic bi-directional skips to title page, contents, figures, references, and a particular page number, and "automatic thumb," i.e., return to marked page. The above remarks imply a reversal of a microfiche black-white relationship from present practice, a precise page alignment, and the addition of standardized coding to the microfiche for automatic positioning. The viewing screen should be near horizontal, and high-quality Xerox-process prints should be available.

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In Summary

It's a truism that a microfiche reader is not a book, and that the user should expect to form a new set of habits which go with the reader, just as he formed a set of habits which go with books. But

there are quite a few centuries of (conscious or unconscious) human engineering in the design of books. I think users have the right to expect that microfiche readers will be human-engineered for their convenience, and that we not have to wait several centuries for this to happen. The human engineering must tackle the two problems of readability and convenience, so that the machine compensates for the deficiencies of the user, instead of vice versa.

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13. ABSTRACT

A survey of user reactions to microfiche, conducted at the request of COSATI, based on over 300 letters received from scientists, engineers, librarians and information specialists. Chapter titles are: Summary, conclusions and recommendations; Background; Department of Defense Libraries; Impact of DDC User Charges; Government Libraries; Industrial Libraries; University and non-profit libraries; Individuals and Microfiche (a) The Enthusiasts, (b) The Reluctant Converts, (c) The Agonistics; Fiche Quality and Format; and Microfiche Readers and Reader Printers. The author tired of bureaucratic prose, devotes most of his text to excerpts from the letters. He recommends three alternative strategies for dealing with microfiche: ignore it and it will go away; drive it underground or, learn to live with it until something better comes along (as it probably will). The text abounds with examples of those who have managed to adopt the last of these strategies.

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